

MARINE REVIEW.

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CLEVELAND, OHIO, THURSDAY, DECEMBER 1, 1892.

No. 22.

Description of the New Lake Light-Ships.

Commander George W. Coffin, naval secretary of the light-house board, says of the new lake light-ships: "The inspectors of the three lake light-house districts, under date of Oct. 28, presented a joint report, relating to the several appropriations made at the last congress for light-vessels, etc., for the great lakes, which joint report was considered at the board meeting of Nov. 7, and in general terms approved. The details of the carrying out of the scheme it was thought advisable to consider further. The officers named stated that three vessels of moderate size, about 80 feet long, 20 or 22 feet beam, with about 8 feet depth of hold, were urgently needed in Green bay. They recommended that one vessel be stationed to cover Eleven-Foot and Corona shoals; one at or near Gravelly island shoal, Poverty island passage, and one at the end of Peshtigo shoal, southerly end of Green bay. They stated that in their judgment four vessels could be built and equipped suitably for use as light-ships from the appropriation of \$60,000, and they recommended that the fourth vessel be stationed at the lower end of Lake Huron, near Corsica and Northwest shoals, or near Poe's reef, upper end of Lake Huron, but preferably near Corsica shoal.

"The board has now these vessels in design, practically on the lines recommended by the above officers. The plans and specifications are being executed with all despatch. Just when it is intended to have these new aids in operation, it is impossible at present to say, but the board will use every endeavor to get them completed and placed at the earliest practical moment.

"The vessels will be provided with one group of three lens lanterns on one mast, similar to those now on the light-ships at Gray's reef, Simmon's reef and White shoal. The vessels will be equipped with boilers and a fog signal engine, capable of sounding a 10-inch whistle. The quarters for the keepers will be built on deck as being more healthy and convenient. Two anchors and chains for each vessel will be provided, and a 10,000-pound sinker for a permanent mooring. The lights will be hoisted and lowered by a hand weight. Each vessel will be provided with a geared capstan windlass, hand power, and the boats will be a yawl and one light Mackinaw built boat."

Big Steamers Running Light in the Ore Trade.

In the transportation of iron ore from Two Harbors, Minn., the best class of lake freight steamers are engaged throughout the season, and it is interesting to note that the average tonnage of 623 cargoes of ore leaving that port during the season just closed is 1,855 gross tons. This average, which would be even greater but for the limited draft in the St. Mary's Falls canal, is certainly very high when the total number of cargoes is taken into consideration. Although the movement of ore from Escanaba is not as large as from Ashland, the shipments this season aggregate 1,155,490 gross tons, or 299,989 tons in excess of the movement during any previous season. Of the total shipments, 436,787 tons went to South Chicago. In a single day, July 9, 17,000 tons of ore was loaded at this port, and the average time of loading and trimming all vessels throughout the season was about three hours. The largest cargo of the season and the greatest ever taken from Lake Superior was 3,220 gross tons, carried by the Minnesota line steamer Maritana. The high average of cargoes and wonderful dispatch at Two Harbors is due to the fact that the great bulk of shipments is in the steel boats of the Minnesota line and other big steamers, running without consorts and in most cases without cargoes on up trips.

Report of Engineer's Trial, Steamer Pioneer.

The trial was made for the purpose of ascertaining the maximum power that could be easily maintained for continuous trips and the results of the Howden forced draught system, with which this ship was fitted. No attempt was made to force the machinery beyond this point. The trial was made Sept. 19, 1892, on Lake Erie, from Bar point light to Buffalo breakwater, a distance of 230 miles. Indicator cards were taken every two hours; also readings from the gauges showing air pressure in ash pit, boiler pressure, vacuum and revolutions. The fan was kept as nearly as possible at a uniform speed of 400 revolutions per minute. The temperature of chimney was taken every four hours by a pyrometer, at a point of about 19 feet above the tubes, which was the only accessible place. The only means of ascertaining the amount of coal used was to measure the amount left in bunkers at the end of the trial, and deduct this from the amount on board at the commencement of the trial, so that results given are only approximate.

VESSEL.

Length over all.....	241'
Length keel.....	225'
Breadth.....	35' 2''
Depth.....	17' 6''
Mean draft at trial.....	14' 8''
Displacement at trial, net tons.....	2,685.
Cargo and fuel, net tons.....	1,810.

ENGINE.

Cylinders diameter, inches.....	20'' 33'' and 54''
Cylinders stroke.....	42''
Propeller diameter.....	12' 6''
Propeller pitch.....	14' 9''

BOILERS.—Fitted with Howden's system of forced draft.

Number.....	2
Diameter.....	12'
Length.....	11' 6''
Number of furnaces, total.....	4
Diameter of furnaces.....	3' 7''
Grate surface, square feet, total.....	164
Heating surface, square feet, total.....	6,204
Ratio.....	37.7
Diameter of fan.....	48''
Area of air main, square inches.....	576
Size of fan engine.....	7''x7''

PERFORMANCE.

Boiler pressure, pounds.....	159.27
Vacuum, inches.....	21.86
Revolutions per minute.....	87.90
Indicated horse power, H. P. Cylr.....	300.
Indicated horse power, Int. Cylr.....	386.
Indicated horse power, L. P. Cylr.....	421.

Indicated horse power, total.....	1107.
Distance run during trial, miles.....	230
Running time, 17 hours and 40 minutes.....	
Speed of vessel, miles per hour.....	13.02
Slip of propeller, per cent.....	11.6
Coal, per hour, pounds.....	1867.8
Coal, per hour, I. H. P., per hour pounds.....	1.68
Coal, per hour, per sq. ft. of grate.....	22.68
Heating surface per I. H. P., sq. ft.....	2.79
I. H. P. per sq. ft. of grate.....	13.46
Air pressure in ash pit, ins. of water.....	.563
Rev. of fan, per min.....	400
Rev. of fan engine, per min.....	182.8
Temperature of chimney, Fah.....	575°
Temperature of feed water, Fah.....	118°

MAXIMUM PERFORMANCE.

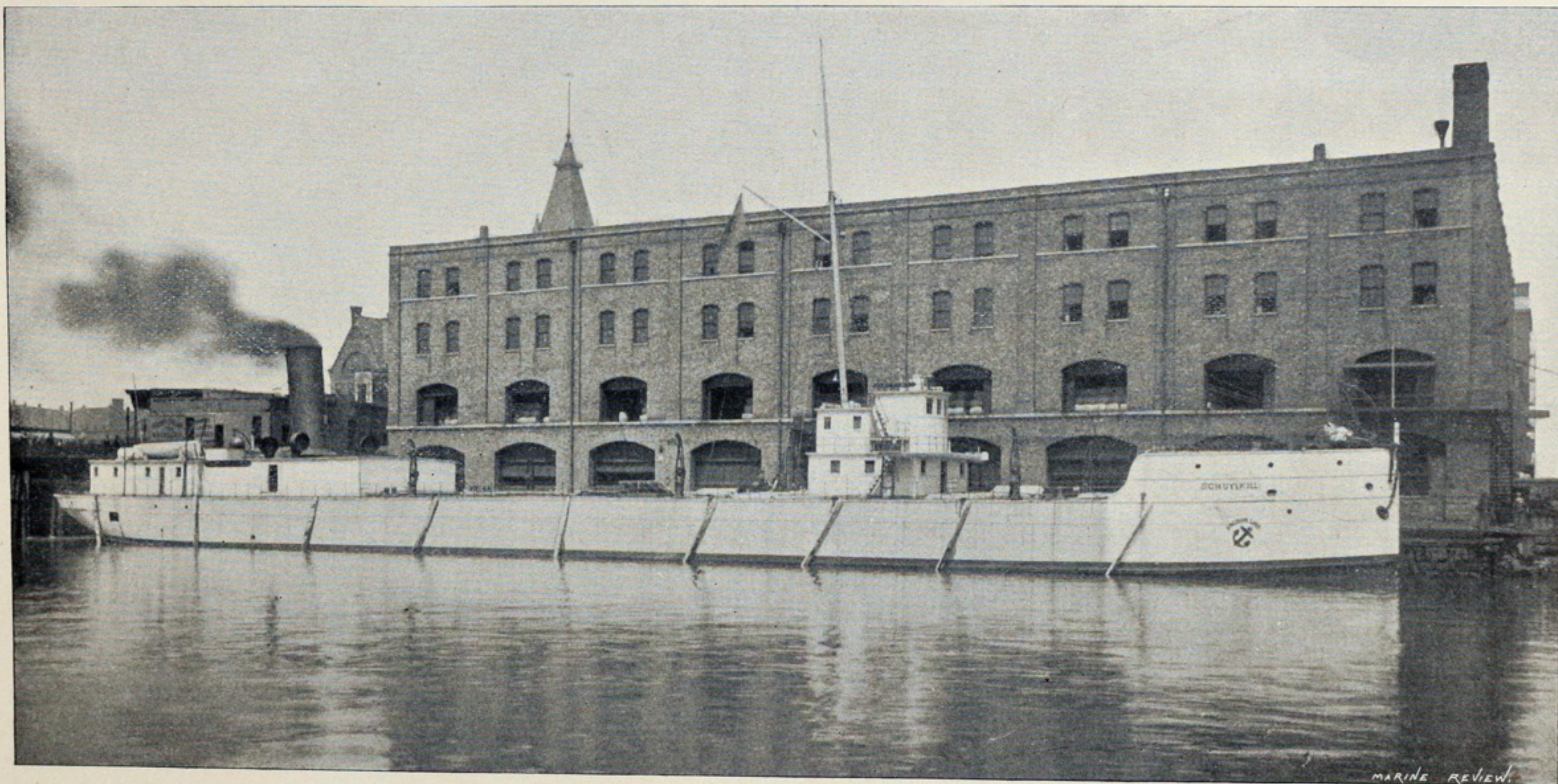
Boiler pressure, pounds.....	165
Vacuum, inches.....	21.5
Revolutions per minute.....	90
Maximum power developed, H. P. Cylr.....	317.
Maximum power developed, Int. Cylr.....	433.
Maximum power developed, L. P. Cylr.....	473.

Maximum power developed, total.....	1223.
I. H. P. per sq. ft. of grate surface.....	14.86

The electric light engine was running for six hours, and steering engine constantly during trial. The last may seem unimportant, but owing to slack in trick gear and tiller chains, the engine had to make a considerable number of revolutions.

The Pioneer was built by the Detroit Dry Dock Company, ship and engine builders, Detroit, Mich.

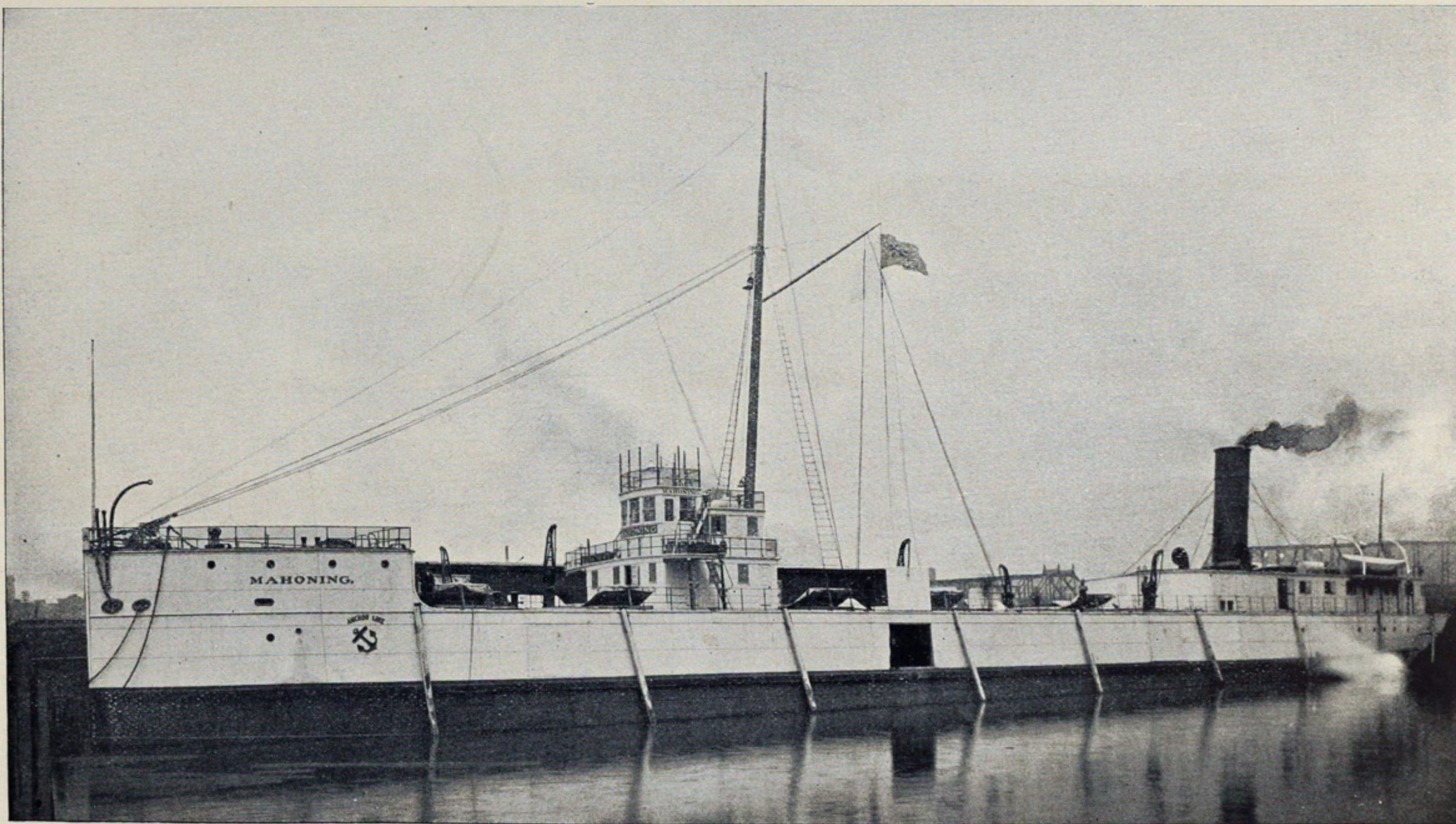
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Supplement to MARINE REVIEW, Cleveland, O.

ANCHOR LINE STEAMER SCHUYLKILL.

Built by the GLOBE IRON WORKS COMPANY.



Supplement to MARINE REVIEW, Cleveland, O.

ANCHOR LINE STEAMER MAHONING.

Built by the DETROIT DRY DOCK COMPANY.

CHICAGO LAKE INTERESTS.

WESTERN OFFICE, MARINE REVIEW,
No. 13 Western Union Building, CHICAGO, ILL., Dec. 1.

The movement of the underwriters to secure a thorough inspection and classification of steel boats is one which doubtless will receive the hearty support of ship builders and vessel owners. The invitations have been sent out for a general meeting next week. Of course, the underwriters are very conservative in talking for publication, but in private conversation the sentiment is clearly expressed that the time is come when some such move must be made, and they think that it is better to force it themselves than to have it forced upon them by outside influence. In this they seem to be entirely in the right. It is certain that insurance on steel boats will be considered in an entirely different light next season than ever before. If the movement is undertaken with an amicable feeling all around, owners, ship builders and underwriters ought to be able to come to an understanding, which will alike be beneficial to all these interests. When one gets down to the bottom of things, the three diverse interests are the same. Ship builders certainly do not care to construct boats whose seaworthiness may be questioned. Owners do not wish to send out craft which may drown their crews, and underwriters have no burning desire to pay many such losses as they have this year. A single doubt as to seaworthiness increases insurance rates. When all three are really of the same mind, Chicago vesselmen hope that there will not be much difficulty in forming the proposed association for publication of the proposed Inland Lloyd's Vessel Register on broader lines.

The Chicago branch of the Shipmasters' Excelsior Marine Benevolent Association has fitted up very pleasant quarters at No. 2 Market street, and will have its opening meeting for the winter there next Monday afternoon at 2 o'clock.

New British-Built Steamer for the Lakes.

Special Correspondence to the MARINE REVIEW.

KINGSTON, Ont. Dec. 1.—The new steel steamer to be built in England for the Montreal Transportation Company will be modeled after the style of boats known as spar deck steamers, with three masts and single screw, and will cost about \$150,000. Her dimensions are: Length over all 254 feet, beam 40 feet, moulded depth 23 feet, depth of hold 20 feet. She will have eight water compartments, with a capacity of about 800 tons. The engines will be triple expansion of 1,000 horse power, and steam will be generated in a battery of steel boilers, capable of withstanding a pressure of 170 pounds to the square inch. The boat will make 12 miles an hour when loaded and 13½ miles when light. The new boat will be constructed entirely of steel—hull, deck, cabins, masts and all—and her capacity will be 62,000 bushels of wheat when drawing 14 feet of water, and 85,000 bushels at 17 feet.

Marine Engine Design.

Written for the Marine Review by W. F. Durand, Principal of graduate school of marine engineering and naval architecture, Sibley College, Cornell University.

In the problem of engine design, the I. H. P. required is usually the fixed quantity, and the design, as a whole, must provide for the development of such power, at the same time fulfilling such other general conditions as apply to the case in hand.

In the first place we shall assume that our engine is to be triple expansion. In such an engine the power obtained is no greater than would be obtained from the L. P. cylinder with the same initial and final pressure. In fact it would be less, due to a drop of pressure between the successive cylinders. This loss is shown graphically by the difference in area between the sum of the three parts of a combined indicator card from a triple expansion engine, and the corresponding card from a single cylinder. Reference may be made on this point to the combined cards given in connection with the test of the steamer Wilbur, published in the MARINE REVIEW during December, 1891.

Experience has shown that this loss will be from 10 to 20 per cent. "But," it may be asked by those not familiar with the matter, "why then use three cylinders, when more than the same power could be gotten from the L. P. cylinder alone?"

The answer is that while this is true, yet the single cylinder would use much more steam for the same power, and therefore much more coal. The crank effort, moreover, would be extremely variable, and for marine work this would require a heavier construction of the engine, besides tending toward a waste of work in shaking instead of propelling the ship.

It is beyond our present limits, however, to discuss the advantage of multiple expansion over single engines, and we therefore proceed with the problem of design.

From what has preceded, it is seen that we may take as a starting point the proper size of the L. P. cylinder to develop under the expected conditions, and after making allowance for the loss spoken of above, the desired I. H. P.

The general relationship of the various factors entering into

I. H. P., may be most conveniently discussed by means of the formula:

$$I. H. P. = 2 P L A N \div 33,000.$$

in which P=Mean effective pressure in lbs. per square inch.

L=Length of stroke in feet,

A=Area of piston in square inches.

N=Number of revolutions per mt.

It may be seen that P A is the total mean effective pressure or load, and 2 L N the distance traveled by it per mt. The product is therefore the foot lbs. per mt., and this divided by 33,000 is I. H. P.

In general then, any combination of the quantities represented by P L A N will fulfill the conditions. Practically, various restrictions limit their values so that the practicable combinations do not cover a wide range. We will note briefly the various considerations affecting the relative values of these quantities. First with regard to pressure:

1. To obtain much power from a given weight of engine, the initial pressure should be high, the expansion slight, and therefore the mean effective pressure (m e p) large.

2. To obtain much power from a given weight of steam, the initial pressure should be high and expansion large, thus making the final pressure and the m. e. p. low as compared with clause 1.

Expansion in one cylinder, however, can not be carried very far without serious loss from initial condensation, and it is to avoid this that the expansion is split up among two or more cylinders, as in multiple expansion engines.

Increasing the pressure of steam necessitates increased care in points relating to packing and lubrication, requires heavier pipes, and other things being equal, a heavier design throughout. Other minor points enter into the consideration, but taking everything into account there seems little doubt but that the present tendency toward higher pressure steam is the correct one, and that this tendency is at present limited by the boilers for its production, rather than by the engines for its use.

Next as to the factor L: The longer the stroke, the lower the revolutions for a given piston speed, or, *vice versa*, the greater the piston speed for a given number of revolutions.

A long stroke is favorable to small diameter of cylinder for given power, and with low speed tends to avoid troubles due to the inertia of reciprocating parts. A long stroke, however, lengthens all the connections, or else introduces great obliquity of the connecting rod with its attendant difficulties. A short stroke tends to avoid trouble from the obliquity of the connecting rod, or with given obliquity allows a lower and more stable engine. It requires, however, for equal power, an increase in revolutions, or diameter of cylinder, or both.

As to A, the piston area, it readily appears, of course, that its increase will allow a decrease in the other factors, and *vice versa*. Aside from general limitations as to size of cylinders, or from some limitation specially related to the case in hand, the area is not especially restricted, and for this reason it is frequently left as the quantity to be determined by the desired values of the other factors. Any such determination is, of course, subject to revision by a modification of the other factors, until a harmonious design is obtained.

Finally as to N, the revolutions per mt.: A high value of N raises the power per lb. of engine, or allows shorter stroke or less diam. for the same power. It tends to introduce trouble due to the inertia of reciprocating parts, and on the whole requires a stronger design and better workmanship than low speeds. A low value of N tends opposite to the above. The question of the value of N can not be considered apart from that of L, the product 2 N L being the piston speed per mt. From the standpoint of efficiency, this should be as high as possible. Mechanical restrictions limit us at present to speeds about 1,000 feet per mt.

To illustrate and apply these principles we may consider the chief points in the design of a triple expansion engine to develop 1,500 I. H. P. We will take the boiler pressure at 160 lbs. gauge—L=3'—6" and N=100.

The fixing of these quantities is a matter of judgment or experience, and we may here note relative to N, that for a given pitch, ratio and diameter of screw, and for a given amount of power to be absorbed by it, there is a certain value of N at which the screw will utilize such power most efficiently. If therefore the problem of propulsion were also before us, we should preferably fix the revolutions at least approximately in this way, and then design the other factors so as to make a practical combination. As it is, however, we assume the revolutions at a point not far from what it would be, had we started with a well designed propeller and designed the revolutions to correspond.

(CONTINUED.)

Iron Mining.

VALUE OF LEADING STOCKS.

Quoted by Chas. H. Potter & Co., No. 104 Superior St. Cleveland, O.

Stocks.	Par Value.	Bid.	Asked.
Cleveland-Cliffs Iron Company.....	\$100 00	\$.....	\$ 57 00
Champion Iron Company.....	25 00	.....	45 00
Chandler Iron Company.....	25 00	.....	43 00
Jackson Iron Company.....	25 00	.....	.....
Lake Superior Iron Company.....	25 00	.....	38 00
Minnesota Iron Company.....	100 00	67 00	72 00
Pittsburgh & Lake Angeline Iron Co.....	25 00	.....	145 00
Republic Iron Company.....	25 00	9 00	10 00
Ashland	25 00	.....	.....
Section Thirty-three.....	25 00	.....	4 00
Brotherton.....	25 00	2 00	2 50
Iron Belt.....	25 00	.....	2 10
Aurora.....	25 00	.....	9 00

Among late announcements from the Mesaba range it is noted that officers in the Great Western company, which controls about 3,500 acres and in which the Merritts are interested, claim to have an offer of \$300,000 from Cleveland parties on forty acres of the property. The land is not entirely explored as yet, but it is said that one pit is 45 feet in ore, and that material advances have taken place in the value of the company's stock. At the Biwabik preparations are being made for the operation of four steam shovels, two locomotives and forty to sixty flat cars, work having been commenced on a Duluth & Iron Range spur to the mine. An electric light plant is being put in and work will be carried on day and night. In anticipation of shipments of iron ore from the new Minnesota mining properties, the Duluth & Iron Range Railway will add at least ten locomotives.

Secretary Noble of the interior department on Saturday rendered a decision ending a mining land contest involving \$5,000,000, which has been in litigation nearly eleven years. The Minnesota Iron Company and George J. Lonstorf become equal owners in a property consisting of 160 acres of a most valuable iron land on the Vermilion range.—Vermillion Journal.

Of the season's shipments from Two Harbors 644,308 tons was from the Chandler, 493,714 tons from the Minnesota, 14,843 tons from the Zenith and 2,625 from the Pioneer.

Opinions Regarding the New Mesaba Ore.

With the arrival of the first cargo of iron ore from the Mesaba range on Saturday last, all of the sales agents in Cleveland were given an opportunity to examine the product of one mine on the new range, and opinions expressed by several representatives of the large companies on the old ranges, who will meet with competition from this ore, are certainly very favorable to interests in the new district. The only objection to the ore which now seems to merit any attention is the opinion expressed by some of the Cleveland agents, that on account of its powder-like fineness some difficulty may be found in smelting it without serious loss in the furnaces through the ore being blown out by the blast, and loss also in transportation through leakage from cars.

The cargo received at Cleveland was from the property of the Mountain Iron Company, and was consigned to Oglebay, Norton & Co., agents. It consisted of 2,073 gross tons, brought to the new ore shipping docks at Superior, Wis., over the Duluth, Mesaba & Northern Railway and carried to Cleveland in the whaleback tow barge 102. The ore was all transferred to cars direct at the Cleveland & Pittsburg docks, Cleveland, and shipped to Pittsburg furnaces.

There is no doubt of the ore being a high grade Bessemer, and it may be that the objections raised regarding its fineness will prove unimportant. Reports from the furnaces as to results from smelting will be secured with little delay and they will undoubtedly prove interesting if made public. Several local chemists made samplings from this first cargo, and it is generally understood that numerous analyses show about 64.50 in iron and .039 phosphorus. These figures are generally accepted as correct. Another cargo of this ore, the last of the season, is now being unloaded from the whaleback steamer 117 at Fairport, O.

The electric lighting plants on the Anchor line steamers Schuykill and Codorus were furnished by the Fisher Electric Company, Detroit, Mich. Each boat has 225 lights. This company not only has furnished ninety per cent. of the electric lighting plants on lake steamers, but continues to take about that proportion of the new contracts.

IRON ORE STATISTICS FOR 1892.

Lake Shipments in Excess of all Previous Years.

Iron ore shipments by lake for 1892 foot up 8,471,605 gross tons, or 408,538 tons more than the lake shipments of 1890, the banner year in the history of the Lake Superior iron ore business. If rail shipments foot up 600,000 tons—they were 650,541 tons last year—the entire output of the mines in 1890, which was 9,003,701 tons, will be exceeded during the present year. It is the general opinion, however, that when the all-rail movement is computed at the end of the month, the entire output of the mines will be found to be a trifle less than in 1890. By a great effort the dock managers at Escanaba succeeded in making the shipments from that port even four millions. Shipments from the different ports are as follows:

SHIPMENTS BY LAKE FOR THREE YEARS.

PORTS.	1890.	1891.	1892.
Escanaba	3,714,662	3,058,590	4,000,000
Marquette.....	1,307,395	1,056,027	993,113
Ashland	2,123,856	1,261,658	2,227,407
Gladstone.....	91,091	177,866	95,595
Two Harbors.....	826,063	890,299	1,155,490
Total.....	8,063,067	6,444,440	8,471,605

Receipts at Lake Erie Ports.—Ore on Dock.

Telegrams from dock managers at all Lake Erie ports make the following showing in connection with the upper lake shipments:

	Gross tons.
Lake shipments from upper lake ports.....	8,471,605
Receipts at all Lake Erie ports.....	6,884,582
Amount on dock Dec. 1, 1892.....	4,092,561

At the opening of navigation on April 15 last there was 1,750,256 tons tons of ore on dock, which added to the receipts of 6,884,582 tons this season, makes a total of 8,634,838 tons. Of this there was shipped to furnaces by rail from Lake Erie ports during the season of 1892, 4,542,277 tons, as shown by the amount now on dock, 4,092,561 tons. Considering the heavy movement of ore from the mines, this showing in shipments to furnaces is very favorable. It is due in part to the general practice among dock companies of granting rebates this year. Following are the statements of receipts and ore on dock in detail:

TOTAL RECEIPTS AT LOWER LAKE PORTS FOR FIVE YEARS.

PORT.	1888.	1889.	1890.	1891.	1892.
Toledo.....	75,601	82,961	164,295	191,105	139,987
Sandusky	154,924	186,682	174,596	106,907	49,736
Huron	4,351	680	1,200	14,910	66,031
Lorain	197,000	280,000	280,450	266,009	190,400
Cleveland	978,775	1,742,415	1,945,492	1,257,775	1,737,672
Fairport.....	611,140	819,121	1,096,408	699,434	864,611
Ashtabula	1,288,530	1,963,490	2,176,730	1,599,785	2,548,175
Conneaut .....	.....	.....	.....	.....	1,130
Erie	240,338	373,595	487,493	393,759	1,080,597
Buffalo	240,000	298,000	548,000	410,000	206,243
Total.....	3,783,659	5,856,344	6,874,664	4,939,684	6,884,582

IRON ORE ON DOCK AT CLOSE OF NAVIGATION.

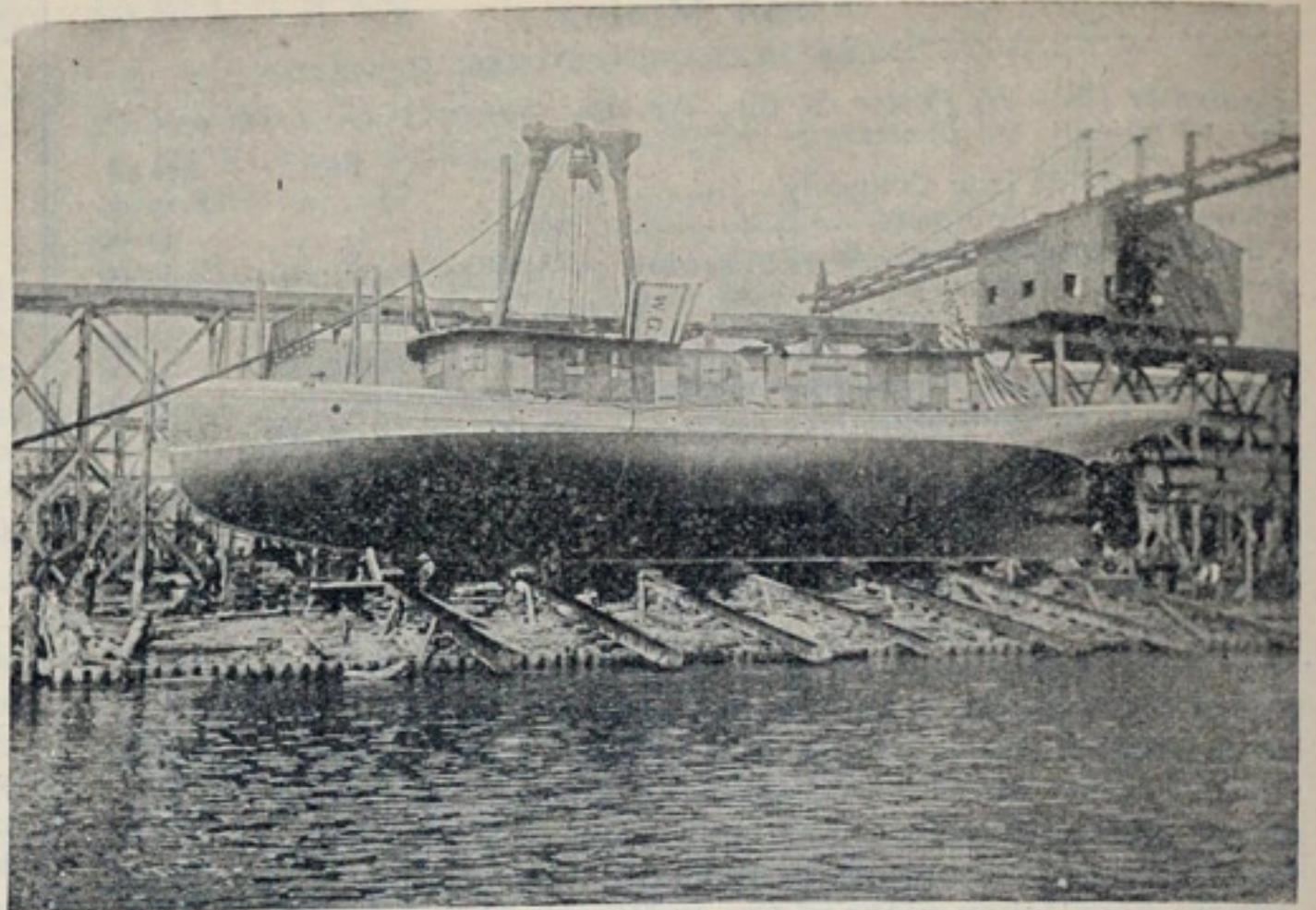
PORT.	1888.	1889.	1890.	1891.	1892.
Toledo	53,255	85,340	110,740	122,515	71,409
Sandusky.....	100,000	175,000	115,000	122,000	87,500
Huron	9,200	39	1,200	14,910	39,500
Lorain	100,000	170,000	210,237	250,812	147,600
Cleveland.....	527,616	518,816	1,209,467	1,114,762	1,196,433
Fairport.....	250,000	390,000	721,000	597,617	608,608
Ashtabula	686,833	1,071,011	1,151,397	903,957	1,254,855
Conneaut .....	.....	.....	.....	.....	.....
Erie.....	95,092	128,900	248,714	252,916	575,506
Buffalo	26,500	68,000	125,732	129,000	111,150
Total.....	1,848,555	2,607,106	3,893,487	3,508,489	4,092,561

It is known that soft Bessemer ores are well sold up, and the condition of stocks as regards sales is, if any, a little better than during the past two years. To the total receipts at Lake Erie docks, as shown in the above table, must be added 258,453 tons, which was received direct at furnaces in Cleveland and Buffalo. This brings receipts at Lake Erie ports up to 7,143,035, which subtracted from the total upper lake shipments of 8,471,605 tons, leaves 1,328,570 tons as the amount which was carried by water to Chicago and Detroit.

A Lake-Built Ocean Tug.

At the ship yard of F. W. Wheeler & Co., West Bay City, Mich., where there is now under construction four steel steamers, one wooden steamer and two schooners, valued in all at \$1,050,000 and capable of carrying about 21,000 gross tons of freight on 16 feet draft, the launch of a steel tug is not a matter of special importance, but there is presented here some engravings showing the launch of the tug W. G. Wilmot, to which considerable interest is attached from the fact that the boat after being fully equipped, at West Bay City, made the trip down the River St. Lawrence and the Canadian canals, and is now in the service of her owner, W. G. Wilmot of New Orleans. Industries, one of the engineering publications of London, printed engravings of this vessel in a recent number and discussed at some length the development of ship building on the lakes. The accompanying engravings are from the Railroad and Engineering Journal of New York, another high class journal, whose publishers are impressed with the importance of an undertaking of this kind on the part of lake builders.

The dimensions of the W. G. Wilmot are: Length of keel, 99 feet; length over all, 110 feet 6 inches; beam, moulded, 23 feet; extreme draft, 11 feet. The propeller is of the H. G. Trout (Buffalo) pattern, and is 9 feet 3 inches in diameter and 12 feet pitch. It is driven by a triple-expansion engine with cylinders 16 inches, 24 inches, and 40 inches diameter by 28 inches stroke. The engine is provided with steam reversing gear, this gear being controlled by a differential motion. The valves are balanced, the high-pressure cylinders being controlled by a piston-valve, the intermediate and low-pressure by ordinary double-ported slide-valves driven by a link-motion of the double side-bar type. The engine has a Wheeler patent condenser with combined air and circulating pump. The boiler is of the cylindrical type, 12 feet 6 inches in diameter and 12 feet 8 inches long. There are three furnaces 40 inches in diameter and 8 feet long, and 218 tubes $3\frac{1}{4}$ inches in diameter and 8 feet 6 inches long. The grate area is 63 square feet, and the heating surface 2,100 square feet. There is also a horizontal return-tube donkey boiler and feed-pump of ample size and a Metropolitan double-



tube injector. A filter for extracting grease from the feed-water is also fitted. An important feature in the equipment of the fire-room is a feed-water heater having 69 brass tubes $1\frac{1}{2}$ inches in diameter and 8 feet long, through which all the exhaust steam from the pumps passes, heating the water surrounding the tubes. There is a large fire pump, a 6-inch bilge suction, and the tug is

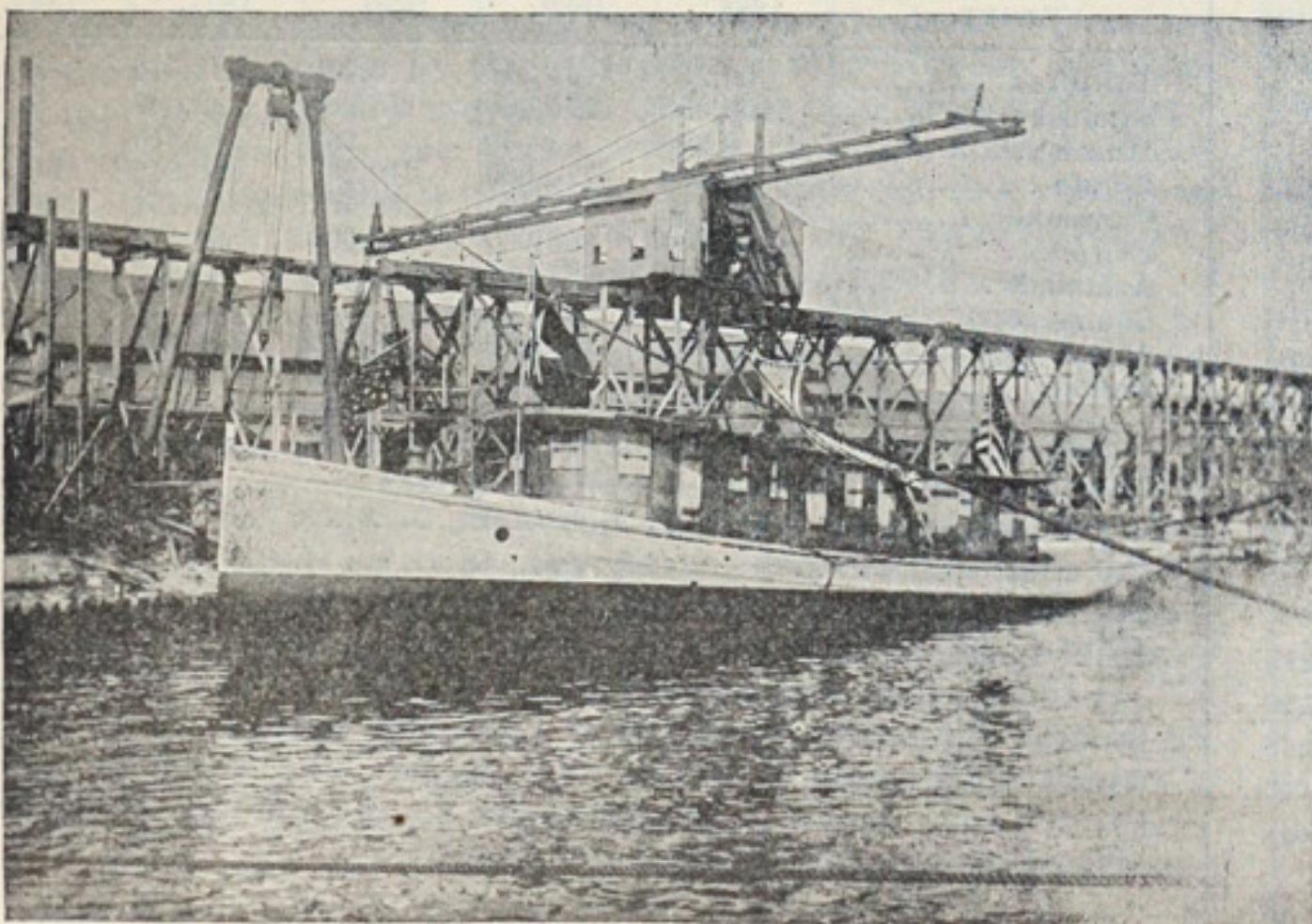
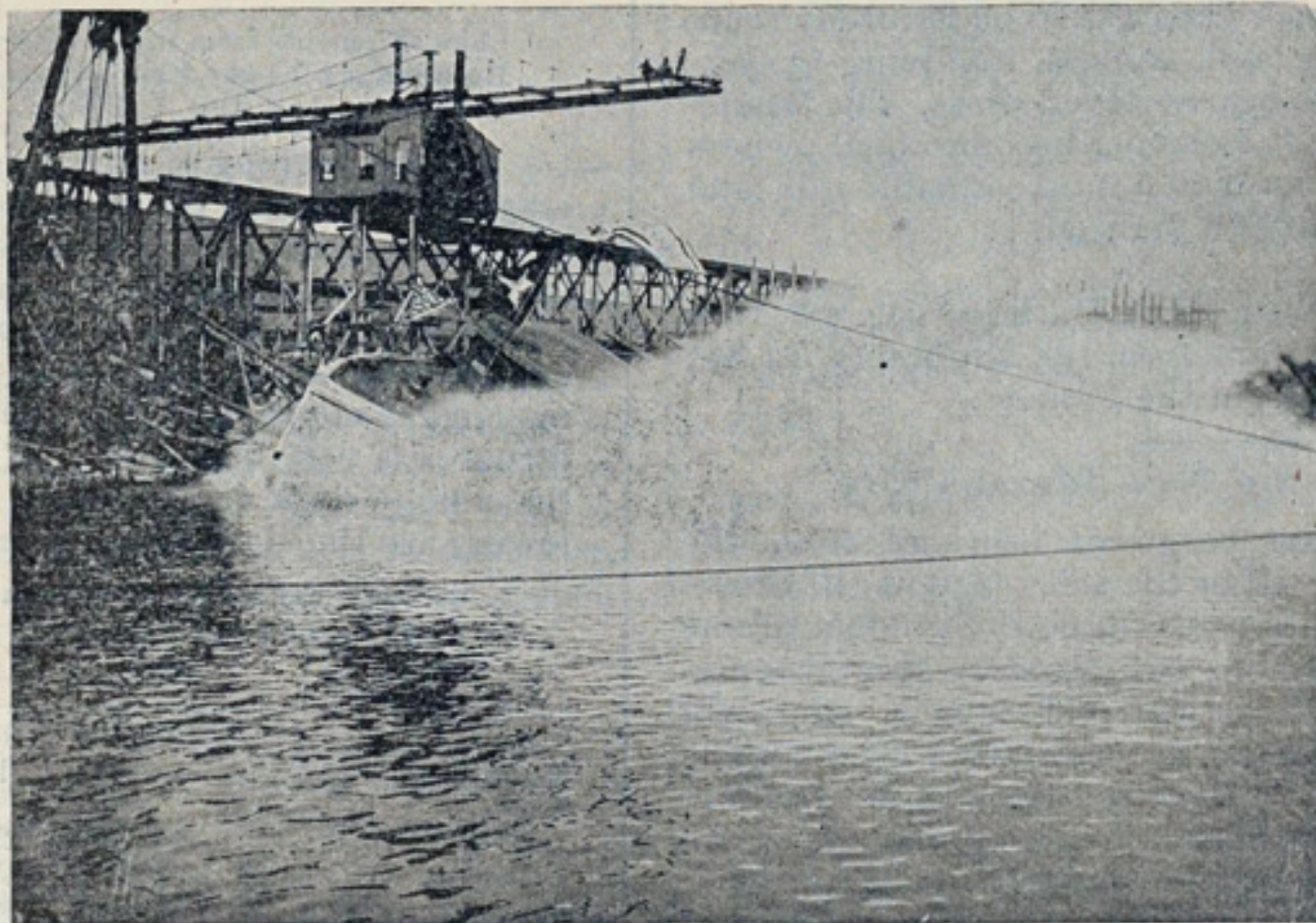
provided with hose for wrecking purposes. A steam steering gear operated by a single lever in the pilot house and a complete electrical outfit, including search light, are other important features in the boat's equipment. On her trial trip in Saginaw bay the Wilmot made 16 miles an hour under partial power, developing 700 horse power on 160 pounds of steam, and 125 revolutions per minute.

Humanity Demands It.

Although a full month has passed since the loss of a crew of eighteen men on the steel steamer W. H. Gilcher,

the owners have as yet learned the names of only ten of the men as follows: L. H. Weeks, master, Vermillion, O.; Edward H. Porter, mate, Lorain, O.; Sidney B. Jones, engineer, Marine City, Mich.; Thomas Finley, second engineer, Buffalo; Charles E. Huntoon, oiler, Marine City, Mich.; Charles Thompson, oiler, Vermillion, O.; Charles E. Williams, steward, Picton, Ont.; F. W. King, wheelman, Chicago; Robert McElhern, watchman, Kingston, Ont.; Albert Bulgreen, fireman, Marine City, Mich. This accident goes to prove more forcibly than anything that has occurred this season the necessity of vessel owners making some arrangements during the coming winter whereby lists of all crews will be left ashore. If they do not do so, congress will very probably pass a law that may put masters to considerable inconvenience, and no objection can be raised to it.

Mr. J. C. Gilchrist, managing owner of the Gilcher, has received a number of letters relative to the accident, from which he is satisfied that the Gilcher went out between the Beavers and the Foxes on the course toward the west shore of the lake, and did not go near the reef south of the Foxes. The most valuable information is from Capt. Charles Roe of Harbor Springs, Mich., who found the two bodies on the north end of South Fox island. Capt. Roe also writes that the boat found on High island, which is west of Beaver island,



was one of the Gilcher's small boats and that a spar with bell attached was found in the same vicinity. Mr. Gilchrist argues that, although the first wreckage drifted up toward the Manitous, the finding of the spar and boat, which might not have been detached until some time after the accident, would indicate that the boat went down, whether by collision or otherwise, northwest of South Fox island.

Visibility of Red, White and Green Lights.

When the International Marine Conference recommended a system of lights on vessels as the preventive of collisions at sea there became necessary the examination of the power and the intensity of lights and the solution of the problem what was the least candle power at which lights of various colors could be clearly seen at definite distances. Certain rules were laid down by which vessels under way or at anchor would display certain prearranged "visible" lights. The matter of signal lights used on shipboard, has been investigated this year to ascertain something more definite as to the visibility by the light-house board of the treasury department, and a committee of experts. The experiments which were to determine what was best for use by the merchant marine as anchor and running lights, were conducted at the Long Beach Bar light station, New York. Three lanterns, fitted for red, white and green lights, respectively, were placed on shore, and observations were made of them from distances of one, two, three, four and five miles from the land. Each lantern was provided with a device which permitted variations of candle power from 1 to 43. The experiments were considered satisfactory except that the light from the light-house interfered somewhat with the results. In these experiments the white light was most satisfactory.

On the first night's observation the weather was clear and very favorable for seeing lights. At one mile the red light at 1.15 candle power was visible, the green light at 1.04 was not visible, while the white light at 1 candle power was clearly visible. At the same distance the red light at 1.45 candle power and the green light at 1.36 candle power were still invisible; the red light at 2.20 was barely visible; the green light at 2.10 was very faint; the red light at 3.20 was fairly visible, the green light at 3.20 was brighter, but not sufficiently distinct. At two miles the red light at 3.30 candle power could not be seen, and was barely visible when the candle power was increased at that distance to 5.75. At two miles the green light at 4 candle power, was invisible, and could be only indistinctly seen when the candle power was increased to 10.50. The red and green lights at 17.15, at two miles distance, were visible, but not distinct in color, and when the candle power was increased to 23.20 the lights were not fully distinct. At two miles, with a candle power of 29, the red and green lights were distinct, while the white light, at 3 candle power, from the same point of observation, was clearly distinct. At four miles the red light at 34 candle power, the green light at 42, and the white light at 10, were easily distinguishable through glasses, but invisible to the naked eye. At five miles the white light at 29 candle power was faintly visible, at 33 clearly visible, and at 43 distinct.

On the second night's observation the weather was cloudy, with a few patches only of clear sky and no moonlight. At one mile the red light, at 1.55 candle power, was indistinctly visible, while the green light required 2.10 candle power to become faintly visible; and the white light required only 1.04 candle power to be seen satisfactorily. At two miles the red light was barely discernable at 5.75 candle power, and the green light indistinctly visible at 10.50, and 42.40 was the least power for a clear color. The red light was distinct enough at two miles at a candle power of 28.60. The white light at three miles was distinct at 3.20, at four miles at 5.60 candle power, at five miles at 17.50 candle power.

The experts found that the problem of determining the least candle power at which colored lights could be seen at definite distances is not capable of a rigorous solution. In the first place, the eyesight of different observers varies, and the lights of a certain candle power would be clearly visible to one while it would be indistinct to another, and might be invisible to a third. Then, too, the nature of the atmosphere, dry or humid, dusty or clean, would have a considerable influence on the range of visibility of the lights, although the night of observation was apparently clear. In the case of colored lights, red or green, the amount of absorption would increase with the density of the color of the glass, and this would also cause much variation in the range of visibility with lights of the same candle power behind it. These

conditions had to be taken into consideration in determining minimum candle power, and care had to be taken in the decision that a proper margin of safety was allowed. The result justifies the recommendation that a white light of one candle power could be used for one-mile distances, of two candle power for two-mile distances, and thirty candle power for five-mile distances. It was evident that less than one power of candle could be seen one mile; still it was thought hardly worth while to use a power less than one candle. The red light of one mile should have four candle power and at two miles forty candle power, and the same candle power was recommended for the green light.

Colored glass absorbs 97 per cent. of the light. This makes it difficult to compare white with colored lights, and there would probably be different results in the observations by different men. There is a decrease of the percentage of loss as the intensity of the light increases, and this circumstance is probably due to the fact that with the lower candle power the brightest part of the flame is used, while with the higher power the upper and lower parts of the flame come into view, and these parts contain more red and green rays.

Another Patent Furnace.

The success of corrugated and ribbed furnaces of Fox's and Purvis's patents is undoubted, in spite of their comparatively high cost and the trouble of properly cleaning and scaling them. I have recently heard of the patenting of another design of furnace, which its inventor expects may probably in a large measure supersede the old-fashioned types. The design and idea is so exceedingly simple that one can only wonder how it was not thought of before. The patentee has conceived the idea of making the furnace precisely the same shape as a barrel, that is with a considerable swell in the center of the length and parallel at the ends. They are to be rolled to the required shape, then welded as simply as a plain furnace. This design thus dispenses with all corrugations and ribs, and as a barrel-shaped structure properly supported at the ends is as strong as anything yet conceived, it may be taken that the new patent will be looked on with considerable interest in engineering circles. In fact, as the patent for Fox's furnaces is almost expired the Leeds Forge Company are stated to be at the present time in negotiation with the patentee for the purchase of the manufacturing rights of the furnace.—Fairplay, London.

To Give Lake Builders a Share of Naval Work.

Recent investigations made by Lieut. G. L. Corden of the United States revenue marine have proven to Washington authorities that lake ship and engine building plants are fully equipped to undertake naval work. It is not known whether recent investigations made by Lieut. Corden (he has made another trip to the lakes since that of last winter, when he represented the New York Times) were official or not, but in any event it is certain that the navy department is satisfied on this question, and there prevails a strong desire at Washington to see lake firms obtain a share of the general construction work. The supposed existence of an international treaty preventing such work is now being fully considered.

For Protection of Tubular Boilers.

A marine bulletin issued by the French government gives instructions for the preservation of tubular boilers when not in use. They should be completely filled with water, the acidity of which has been neutralized by the addition of lime or soda. Externally the tubes should be painted, where accessible, with red lead or coal tar, but such parts as can not be got at for painting may be preserved by burning coal tar under them. The smoke of the tar is condensed in the cold tubes and forms there a protecting layer which prevents corrosion.

Notices to Mariners.

Commander Nicoll Ludlow in charge of the Lake Michigan light-house district gave notice early in the week that, owing to the continued hard gales and freezing weather, little dependence can be placed on the buoys in Green bay and Lake Michigan, at and north of Racine. It will probably be necessary, he said, to take up all buoys in the district at a very early date and vessel masters were cautioned accordingly.

MARINE REVIEW.

DEVOTED TO THE LAKE MARINE AND KINDRED INTERESTS.

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The books of the United States treasury department contain the names of 3,600 vessels, measuring 1,154,870.38 tons in the lake trade. In classification of this fleet the lakes have more steamboats of 1,000 to 2,500 tons than the combined ownership of this class of vessels in all other sections of the country. The number of vessels of 1,000 to 2,500 tons on the lakes on June 30, 1891, was 310 and their aggregate gross tonnage 512,787.58; in all other parts of the country the number of this class of vessels was, on the same date, 213 and their gross tonnage 319,750.84. The classification of the entire lake fleet is as follows:

Class.	Number.	Tonnage.
Steam vessels	1,592	756,751.53
Sailing vessels.....	1,243	325,131.06
Canal boats.....	703	72,515.42
Barges.....	62	20,472.37
Total.....	3,600	1,154,870.38

Tonnage built on the lakes during the past five years, according to the reports of the United States commissioner of navigation, is as follows:

	No. of boats.	Net Tonnage.
1887.....	152	56,488.32
1888.....	222	101,102.87
1889.....	225	107,080.30
1890.....	218	108,515.00
1891.....	204	111,856.45
Total.....	1,021	485,042.94

St. Mary's Falls and Suez canal traffic: Number of boats through St. Mary's Falls canal in 1890, 228 days of navigation, 10,557; tonnage, net registered, 8,454,435. Number of boats through Suez canal during 1890, full year, 3,389; tonnage, net registered, 6,890,014. Number of boats through St. Mary's Falls canal in 1891, 225 days of navigation, 10,191; tonnage, net registered, 8,400,685. Number of boats through Suez canal during 1891, full year, 4,207; tonnage, net registered, 8,698,777.

Entered at Cleveland Post Office as Second-class Mail Matter.

GREAT significance is attached to the proposed formation of a society of naval architects and marine engineers in this country. The increasing importance of American ship building interests and the development of the navy has at last prompted a movement toward the formation of such a society, and there is little doubt that preliminary steps already taken will result in success. The plan of the promoters of the association is to hold the first meeting in New York next spring at the time of the naval review, and fifty or more of the most prominent and influential men in the ship building and shipping interests have accepted invitations to be present. The list of acceptances includes a number of naval officers connected with the departments of construction and covers leading ship builders in all parts of the country. The committee of organization consists of William H. Webb of New York; Louis Nixon, general manager of Cramp's Ship-Building Company of Philadelphia; Col. A. E. Stevens of Hoboken; Francis T. Bowles, naval constructor United States navy, and Clement A. Griscom, president of the International Navigation Company. Mr. Griscom is president of the preliminary organization and W. L. Cappa, secretary and treasurer. The names mentioned in connection with the work of organization are enough to secure success to the society, which may be expected to exert a great influence in promoting the art of ship building.

At Owen Sound, Ont., on Saturday last there was launched by the Polson Iron Works for the Canadian government another revenue cutter similar to the Constance and Curlew, boats built recently at the same place. Some eastern newspapers, notably the New York Times, again make this occurrence the basis for a great deal of sensational talk about the practicability of converting lake freight steamers into war vessels. The two car ferries for service on Lake Michigan, which have just been com-

pleted at Toledo, are picked upon as suitable craft to be converted into harbor defense rams. It is said that the navy department has had these ferry boats inspected and has pronounced them as well designed for harbor defense rams as if they had been originally intended for that purpose. This may all be true, but it is not probable that the building of a small revenue cutter in Canada for the protection of lake fisheries will cause anxiety among the people of lake cities on this side of the border who are acquainted with the difficulties that would attend an effort to get even a few of the smaller class of British war ships to the lakes, and who understand the capacity of the present equipment in lake ship and engine building plants.

AN article in this issue of the REVIEW from W. F. Durand, principal of the School of Marine Engineering and Naval Architecture, Sibley College, Cornell University, will prove highly interesting to designers of lake steamers and their machinery, as well as thinking engineers aboard these vessels who are seeking advancement in their calling. The author, who is an eminent authority, and who has had years of practical experience, discusses some considerations bearing on the determination of the general dimensions of an engine to develop a given power. The article will prove especially interesting to engineers connected with lake ship and engine plants who are ardent supporters of the tendency toward higher pressure steam, which tendency is at present limited by the boilers for its production rather than by the engines for its use. At a future time, a few of the more important details along the line of this article will probably be presented.

IT MAY BE interesting to vessel owners as well as admiralty lawyers to note that in future there will be only two courts for the hearing of admiralty cases. The recent act of congress establishing the United States court of appeals gave to that court final jurisdiction in admiralty, and Judge Taft of the United States circuit court announced, when in Cleveland a few days ago, that in future the circuit court will simply enter up, without any hearing, decrees in all admiralty cases affirming the finding of the district judges.

Performance of Quadruple Expansion Engines.

Following is some data relative to the performance of the tug El Toro, having a quadruple expansion engine designed by Horace See, naval architect of New York city. The cylinders are 9¾, 13½, 18¾ and 26 inches by 22 inches stroke of piston; steam pressure 180 pounds. The boat belongs to the Morgan line of the Southern Pacific Company. She is engaged in New York harbor handling their ships, lighters, etc. When not so engaged, is on fire duty. The full pressure of steam is on the boiler for the entire twenty-four hours. The work done during the year ending Sept. 30, 1892, was as follows:

Steamships towed from Company's piers to Erie basin,	
or distance equal thereto.....	51
Steamships towed from pier No. 37 to 25.....	119
Steamships docked at piers Nos. 37 and 25.....	171
Lighters towed and moored.....	334
Miles run without tow.....	2791
Remaining time on fire duty.....	—
Days in commission.....	361
Coal consumed per day.....	1 1/10 Tons

The engine in addition to being economical in fuel, is also economical in space occupied.

There are about eighteen large concerns engaged in river and harbor work in all parts of the lakes and it is more than probable that every one of them will submit bids on portions of the 20-foot channel work, to be considered by Gen. Poe of Detroit during eight days, beginning with Dec. 9.

A Model Boiler Works.

In a recent issue of the REVIEW a description was given of the new engine works connected with the ship and engine building plant of the Detroit Dry Dock Company, Detroit, Mich., and now there is presented on the following pages some engravings showing the boiler shops connected with these works, known as the Dry Dock Engine Works. These boiler shops, which adjoin the engine works and dry docks, are connected with both by railway switches.

In addition to one small fire box boiler for a tug, there is now building and under contract in these shops eighteen large boilers for the six big freight and passenger steamers to be turned out by the dry dock company this winter. The following table will prove interesting in showing the size of these boilers:

Steamers and Owners.	Number of Boilers.	Diameter.	Length.
No. 112, Mackinaw Car Ferry--	4	11 ft. 6 in.	18 ft.
No. 113, Eddy Bros., Bay City--	2	14 " 2 "	11 " 6 in.
No. 114, D. & C. S. Nav. Co.--	4	12 "	20 "
No. 115, N. Y., C. & H. R. Ry.	2	11 " 6 in.	18 "
No. 116, D. & C. S. Nav. Co.--	4	12 "	20 "
No. 117, Capl. Ruelle, Detroit (tug)-----	1	6 ft. 6 in.	12 ft.
No. 118, Northwest'n Trans. Co.	2	14 " 2 "	11 " 6 in.

The new shop for the manufacture of boilers is 180 feet long, 70 feet wide and about 50 feet in height. The main building, which is about 45 feet in width, is lighted by an immense skylight, and by continuous windows with heavy frames around the outward portions of the sides of the shop just under the roof. In this main building, a 20-ton electric crane is fitted to an overhead system of tracks, so as to operate over the full length and width of the floor space, and another most important feature of the shop is a riveting tower 50 feet in height with a 25-ton radial hydraulic crane and a 100-ton hydraulic riveting machine. Back of the riveting tower and in an adjoining portion of the building is an engine of 100 horse power, two boilers, pump, accumulator and storage tank for the hydraulic machinery. Besides the ordinary punches, shears and countersinking machines, there is included in the general equipment of the works one 18-foot and one 20-foot plate planer, two drilling machines, a set of 20-foot boiler plate rolls capable of rolling plates $1\frac{1}{4}$ inches in thickness and a hydraulic flanging machine. An L shaped addition to this main shop, 30 by 80 feet, which will contain part of the machinery, is now about completed, while in the old boiler shop, which adjoins the new structure, the blacksmiths' fires and some small machines are located.

Accompanying the different views of these boiler works is a view of a portion of the dock yards of the dry dock company, showing the wooden steamer W. B. Morley, built at Marine City, by C. T. Morley, but recently equipped with power by the Dry Dock Engine Works. The shear legs used in the dock yard for this purpose is also shown in the engraving. The Morley is a first-class wooden steamer, valued at \$125,000 and of 1,565 net tons measurement. She has a fore and aft compound engine with cylinders 27 and 50 inches by 40 inches stroke, with air pump, condenser, feed, bilge and cold water pumps connected, and steam reversing gear. She has one boiler 11 feet 6 inches diameter and 16 feet long, of Seamens-Martin steel, built to withstand a pressure of 110 pounds to the square inch.

Three New Anchor Line Steamers.

The supplemental illustrations in this issue of the REVIEW show the three new steamers built for the Erie & Western Transportation Company, the Anchor Line, during the past summer, by three different ship building companies, the Detroit Dry Dock Company, Detroit, the Globe Iron Works Company, Cleveland, and the Union Dry Dock Company, Buffalo. They were built from the same specifications, but each steamer embodies the ideas of the different builders, and there is considerable interest taken in the performance of the boats. General Manager Evans says

that as yet no noticeable degree of superiority has been developed by either steamer. The REVIEW expects to present as soon as obtainable a technical report of the performance, that will show the practical efficiency of different theories held by men who are responsible for the different features in these steamers. The keel length, beam and depth of the hulls are the same in all the steamers—275 feet, 40 feet and 26 feet. The percent. of fullness at bow and stern is distributed differently in each case, although there was not enough lee-way as to desired carrying capacity to allow any radical difference. The steamers are straight-decked, and are the first on the lakes that have straight-decks without the "tumble-home" which accompanies this new feature in the monitors and whalebacks. To secure better appearance, the Globe Iron Works Company added enough shear at either end of the Schuylkill to prevent the apparent drop noticeable in the other two.

Following are particulars of the machinery of the different steamers: The Codorus was engined by H. G. Trout & Co., Buffalo, and the cylinders are 20, 32 and 54 inches by 44 inches stroke. The boilers, two in number, furnished by the Lake Erie Boiler Works, Buffalo, are 14 feet diameter and 12 feet long. The wheel is $12\frac{1}{2}$ feet diameter by 15 feet pitch. The Mahoning's engines are 20, 32 and 54 inches by 42 inches stroke and the boilers are 14 by 12 feet, the wheel being $12\frac{1}{2}$ feet by 15 feet 9 inches pitch. The Schuylkill's engines are 20, 32 and 52 by 42 inches stroke, and her boilers are 14 feet by $12\frac{1}{2}$ feet, the wheel having 15 feet pitch and being 13 feet in diameter.

Nickel Steel for Machinery and Boilers.

Commodore Melville, engineer-in-chief of the United States navy, has begun some very valuable experiments with a view to testing the value of nickel steel for machinery. One of the greatest objects in the way of increasing power in cargo steamers, is the additional weight required in engines and boilers. Marine engineers have found this a great question to contend with, and in England, as well as this country, an effort is now being made to secure a change in the system of testing boilers, with a view to reducing the thickness and weight of the shells. Engineers argue that the margin of safety is far in excess of reasonable requirements in these days of high pressure boilers and improved material and workmanship. The use of nickel steel may now solve the question.

The cost of this steel for machinery or boilers would be slightly, if any, in excess of the cost of ordinary steel, inasmuch as the percentage of nickel used is very small, and is mixed with the charge in the furnace before the metal is poured. It can readily be seen, then, that this metal will have an immense value for use in connection with machinery—if it should prove entirely successful in its present application—when it is learned that its tensile strength is 90,000 pounds per square inch, with 20 per cent. elongation, as against 60,000 and 65,600 pounds tensile strength, with the same elongation, for the carbon steel ordinarily used.

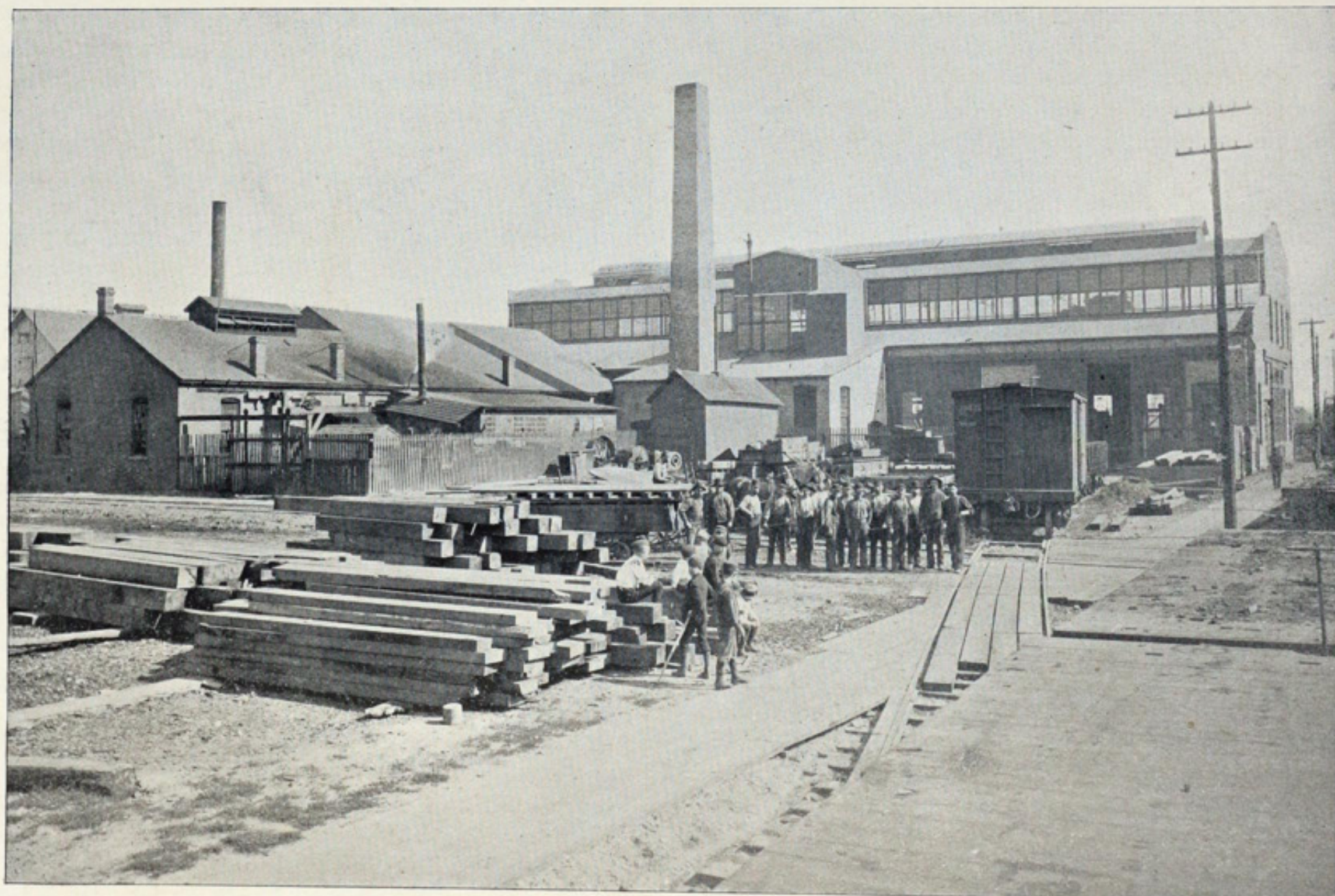
Very little has been published in regard to the use of nickel steel for other purposes than armor plates, but Commodore Melville has been placed in possession of the results of some very valuable experiments which have been made by the Bethlehem Iron Company, and as a consequence has decided to have a section of the propeller shafting of the Brooklyn and the sea-going battle ship No. 1 made of the steel.

Boilers are now constructed of 58,000 pounds tensile steel and sometimes are as much as $1\frac{1}{2}$ inches in thickness. As the thickness is inversely proportioned to the strength of the material, it is a matter of course that if it is possible to use a material whose tensile strength is one and half that now in use, the boiler shells will only have two-thirds the thickness of the present shells, or a boiler would have a shell 1 inch thick instead of $1\frac{1}{2}$ inches.

DRY DOCK ENGINE WORKS, DETROIT, MICH.

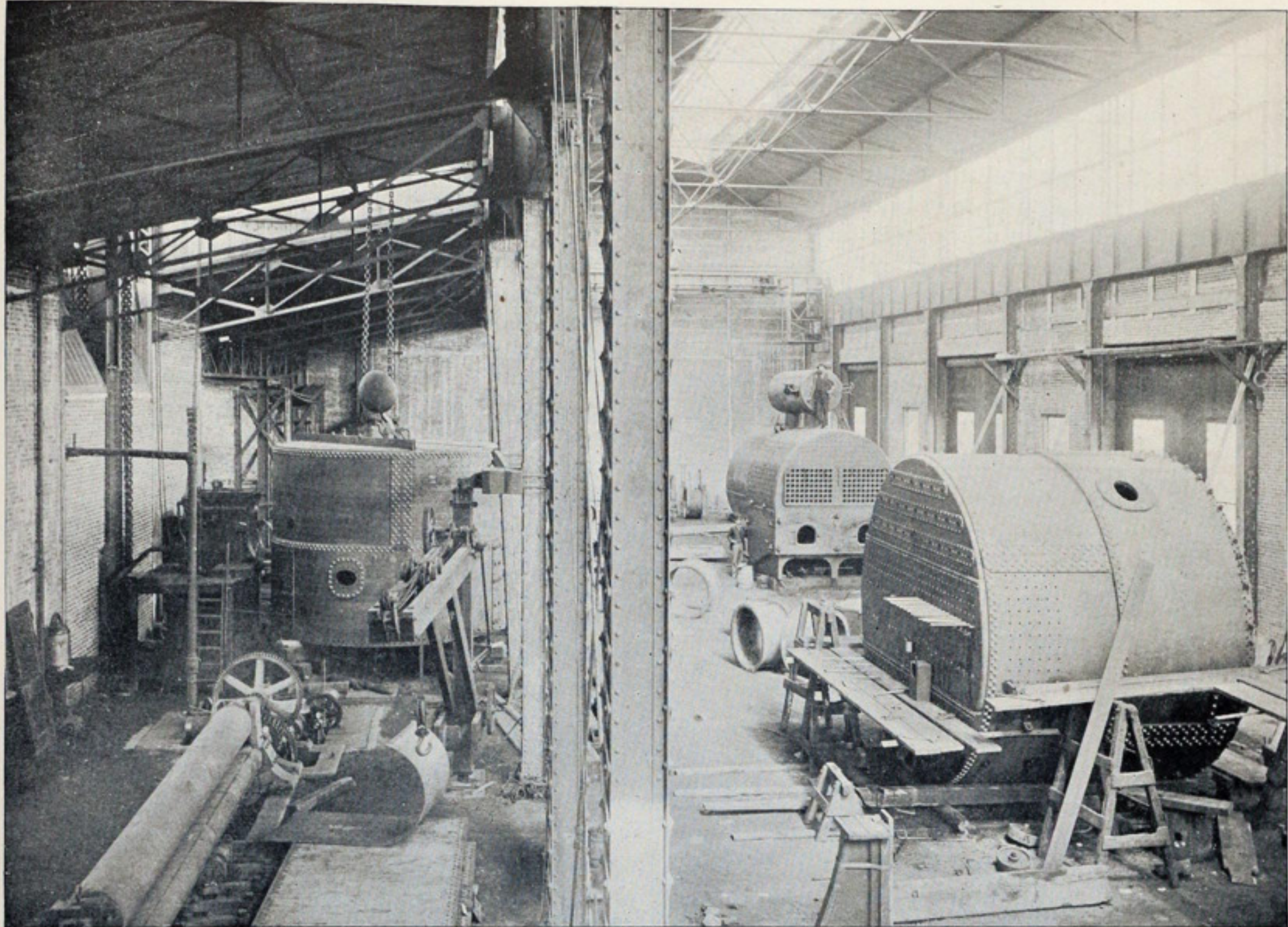


FRONT VIEW OF BOILER SHOP.

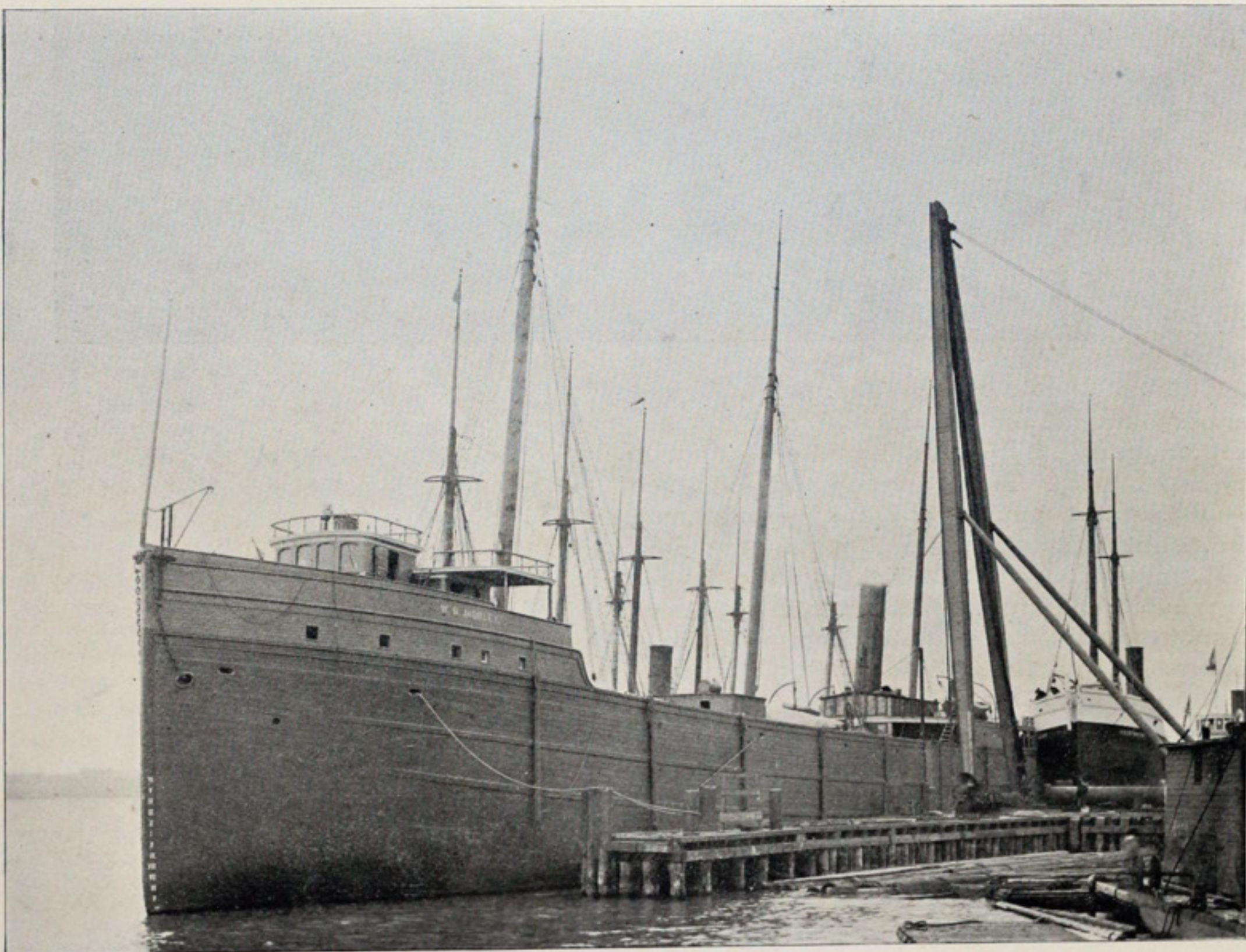


REAR VIEW OF BOILER SHOP.

DRY DOCK ENGINE WORKS, DETROIT, MICH.



INTERIOR VIEW OF BOILER SHOP.



NEW WOODEN STEAMER, W. B. MORLEY, AT SHEAR LEGS.

Important Features in the Five-Day Steamers.

Some very interesting comparisons are brought out in connection with details regarding the powerful machinery of the new Cunard line steamers, now building on the Clyde. The proportion of horse power to displacement is especially remarkable in the machinery of Atlantic liners. The Savannah, built in 1819, had a displacement of 1,850 tons, and an indicated horse power of 90, which propelled her 6 knots an hour, the proportion of horse power being .0048 per ton displacement. Other steamers following between 1836 and 1840, had 1,980 tons displacement and steamed 8 knots, with a proportion of .03 indicated horse power per ton displacement. The size of vessels and proportion of power has since steadily increased, until we now have the Campania and Lucania, which are estimated to travel at a speed of 22 knots an hour, with a displacement of 20,000 tons, and 30,000 indicated horse power, the proportion of horse power to ton displacement being 1.5. Engines of these new Cunard steamers are of the twin-

age speed of 22 knots an hour throughout an ocean voyage from port to port. In this event she would make the trans-atlantic trip in five days. The plans call for a vessel 600 feet long, with a tonnage of 12,000 or 14,000 tons.

The Gunboat Yorktown.

On account of merit in the engraving and in view of the special interest shown by owners of merchant vessels in the new United States Navy, a picture of the gunboat Yorktown is presented here. The Yorktown was built by the Cramps of Philadelphia, and has been in commission about three years. She is a counterpart of the Bennington and Concord and has been stationed on the Pacific. Her principal dimensions are: Length between perpendiculars, 226 feet; depth of hold, 18 feet 9 inches; greatest beam, 36 feet; a displacement of 1,700 tons.

There are two triple-expansion engines placed in separate



UNITED STATES GUNBOAT YORKTOWN.

screw triple expansion five-cylinder type, each having three cranks with a high and low pressure cylinder tandem fashion, with the intermediate cylinder between. In the conveyance of steam the exhaust is from the two high pressure cylinders on top of the forward and after cylinders to the intermediate cylinder, and thence to the forward and after lower cylinders. The high pressure cylinders measure about 41 inches in diameter, the intermediate cylinder 90 inches, and the two low pressure cylinders 105 inches. Each set of engines will develop 15,000 horse power, and the piston speed will be 1,000 feet per minute, whilst the consumption is estimated at 1.4 pounds per indicated horse power per hour, or about 420 tons every twenty-four hours. The total weight of this ponderous mass of machinery, including about 1,200 tons for the boilers, is about 6,400 tons, which, with 3,000 tons of fuel, will absorb 47 per cent. of the vessel's total displacement of 20,000 tons.

From Germany comes an announcement of another five-day steamer. Plans from the Vulcan company, Stettin, have been accepted by the Hamburg-American Packet Company. The builders guarantee that the new steamship will maintain an aver-

water-tight compartments. The air-circulating and bilge pumps are driven independently of the main engines. There are four cylindrical horizontal boilers. The screws are three-bladed, 10½ feet in diameter. The coal supply at normal draught is 200 tons, but the bunker capacity is 400 tons. With the latter supply the ship has an endurance of about 3000 knots at full speed, natural draught, and of about 5000 knots at 10 knots speed. On her official four-hour trial, the Yorktown averaged 16.2 knots with a mean horse power of 3,398.25, an excess of 398.25 over the 3,000 guaranteed, the premium earned thereby, at the rate of \$100 per unit of excess, being \$39,825. On the measured mile trials at Newport, the average speed for four runs was 16.7 knots, and the average horse power 3,660. There is a complete steel water-tight deck reaching from stem to stern. Above and below this deck the vessel is divided into many water-tight compartments. Two sets of dynamos supply electric lights for all parts of the ship. There are two search-lights each of 25,000 candle power. The rig is that of a three masted schooner, spreading about 6,300 square feet of canvas.

Vessels Given Up as Total Losses in 1892.

The following statement shows that fifty-seven lake vessels, having a carrying capacity of 28,708 gross tons and valued at \$1,014,250, have been removed from the lake fleet during the season now closing. In the statement no account is taken of the very large amount of losses through strandings, fire, etc., where the vessels were not given up as total losses. Vessels abandoned to underwriters and afterward released, or raised in cases of sinking, are also excluded. The object is to show simply the tonnage that has passed out of existence. There is no reliable data regarding loss of life, but the total from all causes for the season would be close to one hundred:

NAME OF VESSEL.	OWNER.	Capacity, gross tons.	Valuation
* Ireland, W. S.	John Cooper, Wallaceburg, Ont.	190	\$ 3,000
† Celtic.	Mackay estate, Hamilton, Ont.	413	20,000
* Yosemite.	Estes, Sandusky, O.	350	16,000
Blake, Vernie M.		250	1,500
* aginaw.	Watt, Windsor, Ont.		8,000
* Thew, W. P.	R. Thew, Lorain, O.	472	18,000
† Josephine.	Frank Perry, Sault Ste. Marie, Mich.	480	3,800
† Progress.	F. Schlesinger, Milwaukee, Wis.	1,700	87,000
† Kalamazoo.	Griffin, Saugatuck, Mich.	246	12,000
* Persia.	S. L. Martin, Racine, Wis.	150	1,000
Kincardine.	Jones, Goderich, Ont.	281	7,000
† Wilds, A. E.	Capt. B. Wilds, Detroit, Mich.	351	23,000
* British Queen.	Capt. Smith, Trenton, Ont.	200	1,000
* Danforth, F. L.	W. F. Upham, Duluth, Minn.		6,000
* Griffin, John B.	W. A. Creech, Cleveland, O.		3,000
Burnside, Gen'l.	Thompson, Port Huron, Mich.	492	1,800
Gulnair.	Myles & Son, Hamilton, Ont.	591	5,000
Lady Macdonald.	Hargrave, Port Burwell, Ont.	533	6,000
* Remora.	S. H. Davis & Co., Detroit, Mich.	179	10,500
Princess Louise.	Rothwell & Co., Kingston, Ont.	145	5,000
Western Reserve.	Minch and others, Cleveland, O.	3,000	220,000
* Paige, John A.	Coburn and others, Duluth, Minn.		65,000
Guiding Star.	C. H. Weeks, Bay City, Mich.	545	4,000
City of Toledo.	Manistee Lumber Co., Manistee, Mich.	448	4,500
Vienna.	rient Trans. Co., Cleveland, O.	1,200	46,000
Glicher, W. H.	Gilchrist and others, Cleveland, O.	3,000	200,000
* Corinthian.	R. O. W. Co., Toronto, Ont.	500	40,000
Hale, Mary B.	J. W. Schlig, Racine, Wis.	436	2,000
Burt, John.	R. Kelley, Detroit, Mich.	600	5,500
Roland.	K. I. L. & T. Co., Cleveland, O.	260	10,000
Flying Cloud.	Ed Cummertford, Chicago, Ill.	400	4,000
* Hercules.	D. J. Brown, Sandusky, O.		4,000
Hammond, Nellie.	Anderson, Waukesha, Wis.	45	600
Samana.	B. Hoose, Detroit, Mich.	474	3,000
Chandler, Zack.	C. E. Benham, Cleveland, O.	1,190	10,500
Nichols, A. P.	Clow & Son, Chicago, Ill.	485	7,500
Glad Tidings.	J. Mullerweis, Alpena, Mich.	110	3,000
Ostrich.	Capt. John McKay, Milwaukee, Wis.	465	1,000
Wesley John.	A. P. Read, Chicago, Ill.	550	6,000
Seaton.	Wm. Christie, Erie, Pa.	430	3,500
Marquis.	Christie & Co., Toronto, Ont.	888	6,000
Palmer, E. B.	Gillet & Marquette, Mich.	468	6,000
Davis, Minnie.	Dunford & Alverson, P. Huron, Mich.	364	2,500
Nashua.	Sturtevant Lumber Co., Cleveland, O.	557	15,000
* Munroe, C. J. G.	Munroe, St. Catharines, Ont.		6,000
Wells, Hattie.	F. L. Wells, Port Huron, Mich.	557	9,000
Neelon, Sylvester.	Flat & Bradley, St. Catharines, Ont.	697	7,000
Newburgh.	Maytham, Buffalo, N. Y.	695	47,000
Hercules.	McGibbon, Port Burwell, Ont.	447	4,000
Vought, Annie.	Peter Wex, Buffalo, N. Y.	1,067	13,500
Dall, Lincoln.	D. Dall, Chicago, Ill.	372	1,800
Pratt, Lillie.	J. & L. Clark, Chicago, Ill.	364	3,500
Gillmore, J. E.	J. Gerlach, Cleveland, O.	526	3,500
Falconer, Annie.	Taylor, Kingston, Ont.	381	4,000
Kremer, C. E.	Gondreau, St. Ignace, Mich.	14	2,000
Hall, Lena.	Capt. Albert Hall, Kenosha, Wis.	150	750
Amadeus, James.	P. Smith, Cleveland, O.		4,000
		28,708	1,014,250

* Burned. † Collision.

NOTE.—All boats unmarked either went ashore or foundered.

Innovations in the Hill Steamers.

It is now intended to put quadruple expansion engines and Belleville boilers into the two Northern line, twin-screw passenger steamers, upon which work is well under way at the yard of the Globe Iron Works Company, Cleveland. General Manager Gordon of the Northern line was in Cleveland this week and was accompanied by Mr. Miers Coryell of New York who will represent the owners of the big passenger steamers in matters pertaining to the designing and construction of machinery. Work on some portions of the hulls has been suspended in order to make changes necessitated by alterations in the plans for this extraordinary power. Belleville boilers are in use in French steamers containing a great deal more power than will be developed in these boats, and there is no doubt that they are entirely practicable and will permit of a great saving in weight.

Work of the Ship Yards.

Work on the bottom of the steel steamer Matoa of the Minnesota line, which was ashore near the piers at Ashtabula, will probably make up the largest job of repairs of this kind ever required on a steel vessel on the lakes. From bilge to bilge throughout the steamer's entire bottom forward of the engines is a battered mass of material, and at one point there was a space of about a foot between the keel blocks and the bottom of the vessel when she was placed in dock. Even portions of the upper part of the water bottom must be taken out and straightened.

The steamer certainly received very hard usage on the rocks where she was stranded, and the fact that she was kept afloat at all without extraordinary efforts after being released speaks well for her construction.

It is announced from West Bay City that F. W. Wheeler & Co. will build on their own account a steel steamer of 328 feet keel, with triple expansion engines and other important features of modern lake vessels.

The launch of the steamer Selwyn Eddy will take place at the Wyandotte yard of the Detroit Dry Dock Company, at 3 o'clock on Saturday, Dec. 3. The Eddy is a steel, straight-back steamer, 360 feet long, 42 feet wide and 24 feet deep.

Hingston & Son of Buffalo launched a fishing tug 65 feet long a few days ago. The boat is for F. M. Driggs of Dunkirk, N. Y., and is named Puritan.

Managers of the American Steel Barge Company are considering the advisability of constructing another big dry dock at Superior.

Stocks of Grain.

The following table prepared from the Chicago Board of Trade report of the visible supply of grain on Saturday, the 26th inst., shows with comparisons stocks of wheat and corn in store at points of accumulation important to the lake traffic:

	WHEAT, BUSHEL.		CORN, BUSHEL.	
	Nov. 26, '92.	Nov. 19, '92.	Nov. 26, '92.	Nov. 19, '92.
Chicago.....	10,038,000	9,983,000	5,339,000	6,266,000
Duluth.....	7,984,000	7,897,000		
Milwaukee.....	2,023,000	2,006,000	8,000	9,000
Detroit.....	1,165,000	1,146,000	45,000	54,000
Toledo.....	3,598,000	3,541,000	173,000	193,000
Buffalo.....	3,959,000	3,570,000	736,000	530,000
New York.....	15,512,000	15,581,000	1,633,000	1,138,000
Baltimore.....	2,287,000	2,302,000	320,000	255,000
Philadelphia...	1,799,000	1,990,000	319,000	333,000
Boston.....	250,000	247,000	353,000	383,000
Montreal.....	365,000	427,000	16,000	15,000

The statement shows that at five lake shipping ports, Chicago, Duluth, Milwaukee, Detroit and Toledo, there is an increase for the week of 235,000 bushels of wheat and a decrease in corn of 957,000 bushels, while at Buffalo and the five principal exporting ports on the seaboard, New York, Baltimore, Philadelphia, Boston and Montreal, there is a net increase in wheat of 55,000 bushels and a net increase in corn of 723,000 bushels.

Around the Lakes.

The new torpedo planter, now being finished for the United States government and which will be used at Willet's point and vicinity, has a Roberts boiler with 21 square feet of grate and 700 square feet of heating surface.

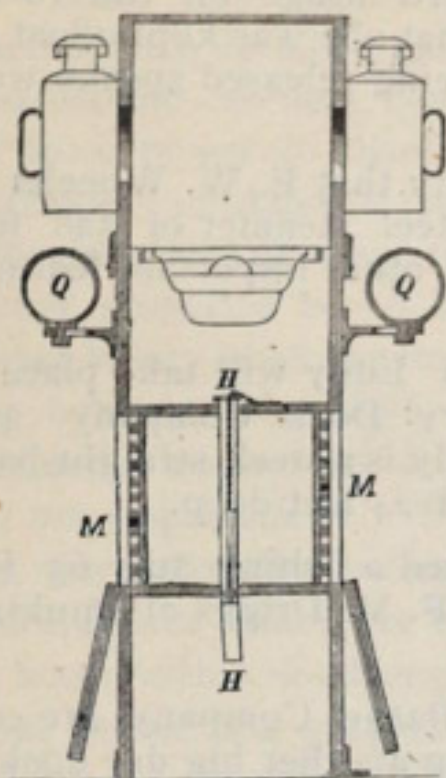
The steamer Frank E. Kirby left Detroit Sunday morning at 9:30 went to Sandusky, loaded 162 tons of sugar, returned by way of Put-in-Bay and arrived in Detroit at 9:30 the same evening. The number of miles run was 160.

In another part of this issue is an advertisement for twenty engineers and pilots to run steam launches for C. P. Willard & Co., Chicago, in connection with the world's fair during next summer. The positions will be pleasant ones and afford an opportunity of seeing everything to be seen at the great exposition.

John W. Moore, for many years harbor-master at Detroit, died at his home in that city Saturday. From Chicago, the death of Capt. A. W. Rossman is reported. He was seventy-five years of age and had commanded lake vessels for over fifty years. Capt. Rossman was commodore of the fleet of the old Northern Transportation Company and was in the Goodrich line up to within a few weeks of his death.

State of Ohio and State of New York are the names selected for the City of Alpena and City of Mackinaw when they begin running in the new line between Cleveland and Buffalo next season. General Manager Carter of the Detroit and Cleveland Steam Navigation Company says that the present officers of these boats will be given positions on the new D. & C. boats when they come out next summer.

ST. MARY'S RIVER CHARTS NOS. 1 AND 2 FROM POINT IROQUOIS TO E. NEEBISH AND FROM MUD LAKE ENTRANCE TO E. NEEBISH, CORRECTED TO AUG. 30, 1892, CAN BE HAD AT THE OFFICE OF THE MARINE REVIEW, 516 PERRY-PAYNE BUILDING, CLEVELAND, FOR 20 CENTS EACH, OR BOTH BY MAIL FOR 50 CENTS. BOTH CHARTS WILL BE FURNISHED WITH CLOTH BACKS AND BOUND EDGES FOR \$1.



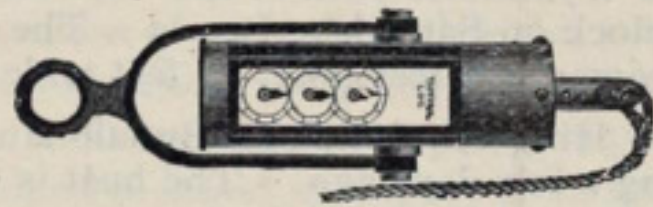
PATENT ADJUSTABLE BINNACLE AND COMPASS

For PILOT HOUSES.

With Directions for Adjustment.

Send for Circular.

TAFFRAIL LOG,



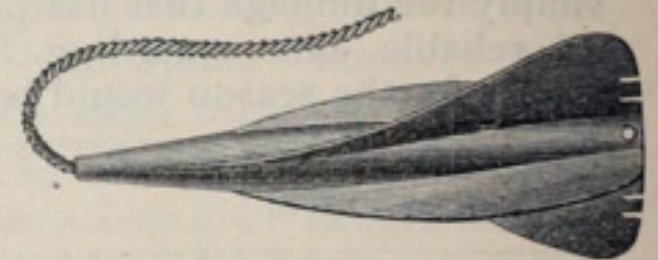
With Adjustable ROTATOR.

BEST LOG IN THE MARKET.

THOUSANDS IN USE.

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RECORD,
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J.L. WILLIAMS,
JOE. DUDLEY.

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MANAGER

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DULUTH, MINN.



• TUGS •
EFFIE L.
WALTON B.
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LIDA,
FIRE-BOAT
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STEAM PUMPS, HAWSERS, LIGHTERS AND DIVING SUITS FURNISHED ON SHORT NOTICE.

L. P & J. A. SMITH, Contractors of Public Works, CLEVELAND, O.

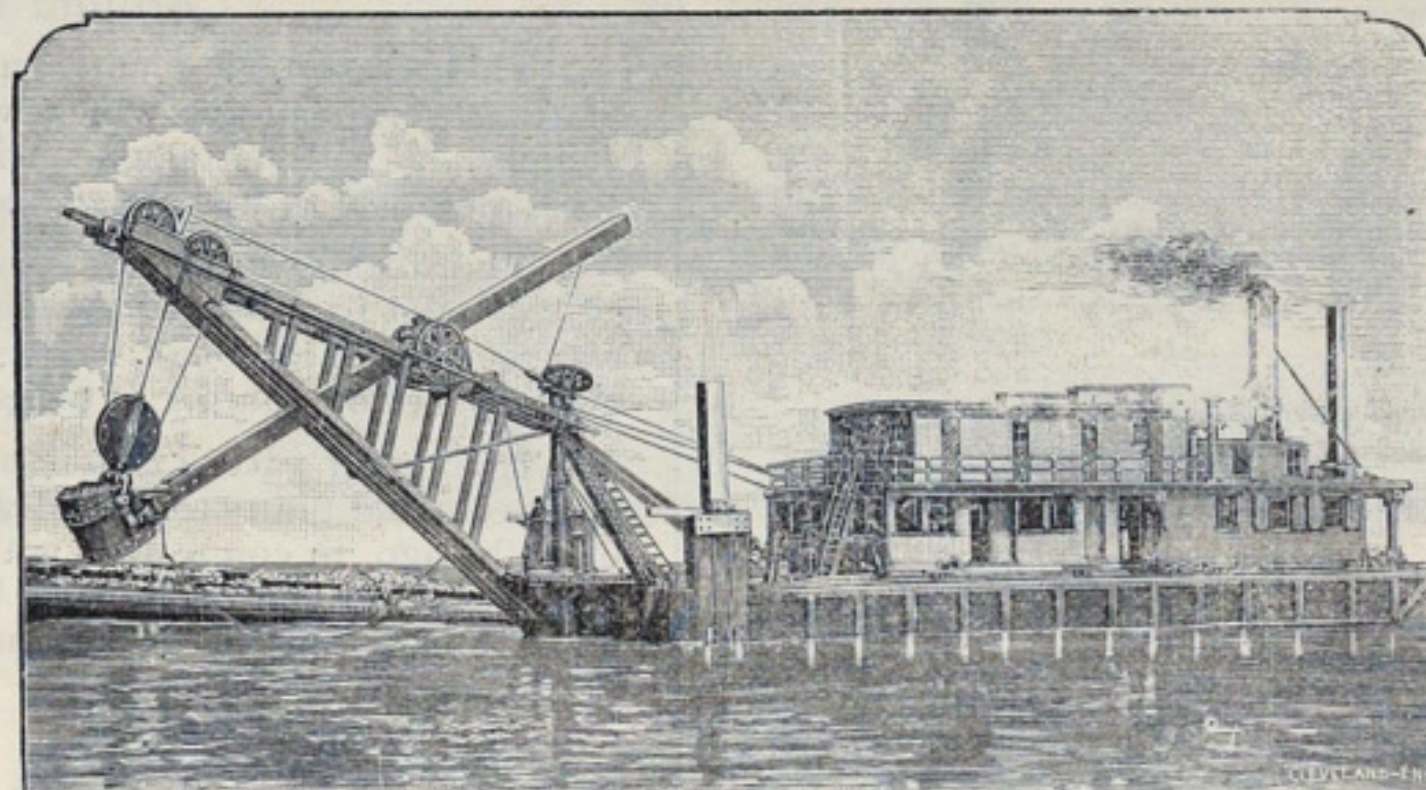
DREDGING,

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BREAKWATERS,

DRY DOCKS and

PIER BUILDING.



RAILROADS,

CANALS,

BRIDGES,

FOUNDATIONS,

&c., &c.

OFFICE: No. 1 FRONT ST.

UNITED STATES ENGINEER OFFICE,
Grand Rapids, Mich., November 8, 1892.
Sealed proposals for pier construction at the
harbors of Muskegon and Grand Haven, Mich.,
will be received at this office until 10 a. m., on
December 1, 1892, and then publicly opened; and
proposals for like work at the harbors of Manis-
tee and St. Joseph, Mich., and Michigan City,
Ind., will be received at this office until 10 a. m.
on December 2, 1892, and then publicly opened.
Specifications, blank forms and all available in-
formation will be furnished on application to
this office. WILLIAM LUDLOW, Major of
Engineers, Bvt. Lieut. Col., U. S. A. 17-24.

U. S. ENGINEER OFFICE, HICKOX BUILD-
ing, 185 Euclid Avenue, Cleveland, Ohio,
November 1, 1892. Sealed proposals for dredg-
ing in straight channel through Maumee Bay,
for Toledo Harbor, Ohio, will be received at this
office until 2 p. m. of Thursday, December 1, 1892,
and then publicly opened. Specifications, blank
forms, and all available information will be
furnished on application to this office. JARED
A. SMITH, Corps of Engineers, U. S. A.

SEND 50 CENTS IN STAMPS TO THE MARINE REVIEW FOR
TEN PHOTOTYPES AND GRAVURES OF LAKE STEAMERS NEATLY
BOUND.

U. S. ENGINEER OFFICE, HICKOX BUILD-
ing, 185 Euclid Avenue, Cleveland, Ohio,
November 22d, 1892. Sealed proposals for ex-
tending East and West Piers at Fairport Harbor,
Ohio, will be received at this office until 2 p. m.
of Thursday, December 22d, 1892, and then
publicly opened. Specifications, blank forms
and all available information will be furnished
on application to this office. JARED A. SMITH,
Corps of Engineers, U. S. A. 15

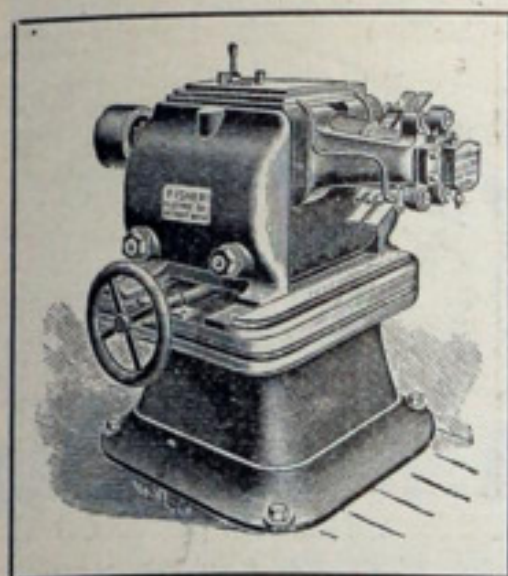
ANY ONE SENDING TWO ADDRESSES AND \$4 TO THE MARINE
REVIEW, 516 PERRY-PAYNE BUILDING, CLEVELAND, WILL, IN
ADDITION TO HAVING THE BEST MARINE PAPER SENT TO THEM
FOR A YEAR, RECEIVE A COPY OF WASHINGTON IRVING'S LIFE
AND VOYAGES OF CHRISTOPHER COLUMBUS.

FOUND ON SOUTH SHORES OF LAKE ERIE, A FLAT SCOW.

72 Feet Long, 20 Beam and 4 Feet Hold.

Made of Norway Pine and other soft wood. It is now at Ashtabula. The owner will
please call and prove property and pay expenses or it will be sold to pay the same.

J. M. TOWNSEND, Harbor, O.



AUTOMATIC INCANDESCENT LIGHTING PLANTS



OF OUR MANUFACTURE are endorsed by the following Owners and Managers of some of the Finest Steam Vessels on the Lakes:

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W. P. HENRY, BUFFALO, N. Y. General Manager Lehigh Transit Co.	Four Steel Freight Steamers
JOHN GORDON, BUFFALO, N. Y. General Manager Northern Steamship Co.	Five Steel Freight Steamers
DAVID CARTER, DETROIT, MICH. Gen'l Mgr. Detroit & Cleveland Steam Navigation Co.	Three Side-wheel Passenger Steamers
T. F. NEWMAN, CLEVELAND, O. Gen'l Mgr. Cleveland & Buffalo Transportation Co.	Two Side-wheel Passenger Steamers
J. C. RICKETSON, MILWAUKEE, WIS. General Manager Inter-Ocean Transportation Co.	One Steel Freight Steamer
A. W. COLTON, TOLEDO, O., General Manager Lake Erie Transportation Co.	One Side-wheel Passenger Steamer and four Freight Steamers
L. C. HANNA, CLEVELAND, O. President Mutual and Menominee Transportation Companies.	Nine Steel Freight Steamers
JAMES PICKANDS, CLEVELAND, O. President Minnesota Steamship Co.	Four Steel Freight Steamers
HARVEY H. BROWN, CLEVELAND, O. Brown Steamship Co. and Lake Superior Iron Co.	Five Steel Freight Steamers
SAMUEL MATHER, CLEVELAND, O. President Huron Barge Co.	One Steel Freight Steamer
ASHLEY & DUSTIN, DETROIT, MICH.	One Side-wheel Passenger Steamer
U. S. LIGHT-HOUSE BOARD, WASHINGTON, D. C.	Two Light-House Tenders

IF YOU WANT your Steamer equipped with an

Automatic Incandescent Lighting Plant,

Which can be handled by an engineer without any previous knowledge of electric plants, and which will operate arc and incandescent lamps from the same dynamo, write the

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O. S. RICHARDSON, Pres.

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MARINE REVIEW LINER EXCHANGE.

Space under this heading may be used gratis by our advertisers or subscribers to call attention to vessels or any craft, machinery, new or second hand, that they may have for sale. Those wanting machinery of any kind or wishing to purchase vessels, are invited to take advantage of the same offer. Employers in need of professional men or men who want positions may avail themselves of the opportunities offered. Each item will be limited to three lines. Letters concerning same must mention number attached to item and be addressed MARINE REVIEW, 516 Perry-Payne Building, Cleveland, O.

154—FOR SALE—Yacht, 32 feet long, 6 beam, 4 deep. Engine 6 x6. Boiler upright; 130 lbs. steam. To be had for \$400.

155—FOR SALE—A 17x20 High Pressure Marine Engine—very cheap.

156—FOR SALE—At a bargain, 30-foot sloop yacht, built this year and in first-class condition.

157—WANTED—Good second-hand Marine boiler, tested to 100 pounds, for use in a steambarge.

158—FOR SALE—12-inch Silsby Wrecking Pump, with capacity for 2,500 gallons. Price low.

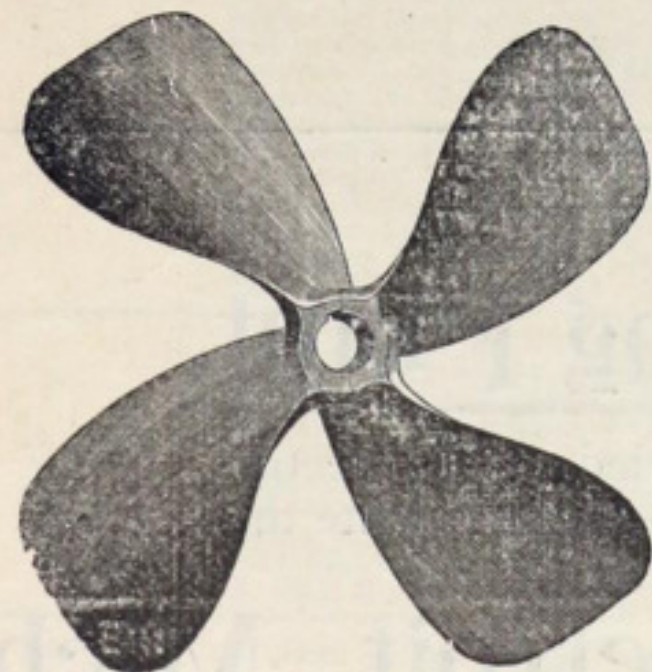
159—FOR SALE—Lighter, 72 feet long, 16 feet beam, and 5 feet deep. Will sell for \$300.

160—WANTED—A second-hand tug engine, compound preferred; size to equal about 24 by 24.

161—FOR SALE—Second hand marine boiler, 8 feet face and 13 feet long, with steam chimney about seven years old, but has been used only a short time and is in good order; built at Washington navy yard and has composition tubes; plates of Otis steel, double riveted nearly all over on external seams; will inspect for 95 pounds.

U. S. ENGINEER OFFICE, 34 WEST CONGRESS ST., Detroit, Mich., November 9, 1892. Sealed proposals for furnishing all labor, materials, and appliances, and excavating a ship channel 20 and 21 feet deep between Chicago, Duluth and Buffalo, will be received at this office until 2 p. m., standard time, on the following dates, and then publicly opened: For third section, Sailors' Encampment, on December 9, 1892; for seventh section, Grossepont Flats, on December 10, 1892; for sixth section, St. Clair Flats, on December 12, 1892; for eighth section, mouth of Detroit River, on December 13, 1892; for second section, Little Mud Lake, on December 14, 1892; for fifth section, foot of Lake Huron, on December 15, 1892; for fourth section, Mud Lake Shoal, on December 16, 1892; for first section, Round Island Shoals, on December 17, 1892. Specifications, blank forms, and all available information will be furnished on application to this office. O. M. POE, Colonel Corps of Engineers, Bvt. Brig.-General, U. S. A.

H. G. TROUT, KING IRON WORKS, BUFFALO, N. Y.,



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**TRIPLE EXPANSION,
THREE CYLINDER,
FORE AND AFT
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MARINE ENGINES,**
High and Low Pressure Engines,
Sectional, Propeller,
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Cowles Aluminum and Manganese
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These Wheels are noted for their extra speed, towing power and proportionate saving of coal.

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As specified by the Pennsylvania Railroad Company, for use on
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May be applied with a Brush in same manner as Paint.

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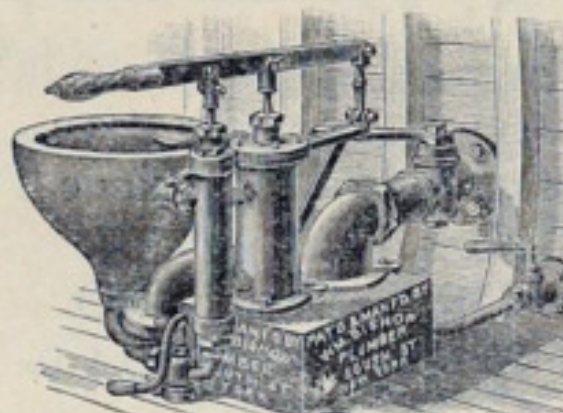
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phototypes and gravures of lake steamers neatly bound.

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For Yachts, Pilot Boats,
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For above or below water line. No tank needed, and when below water line you can flush bowl without having to use pump.

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Yacht Fittings a Specialty.

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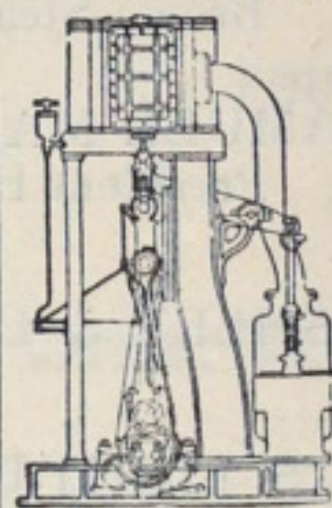
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After Dec. 31st, 1892, the subscription price will be advanced to \$2 a year.

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RESULTS:

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Stoppage of Lard Oil account.
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Dark lines indicate apparatus.

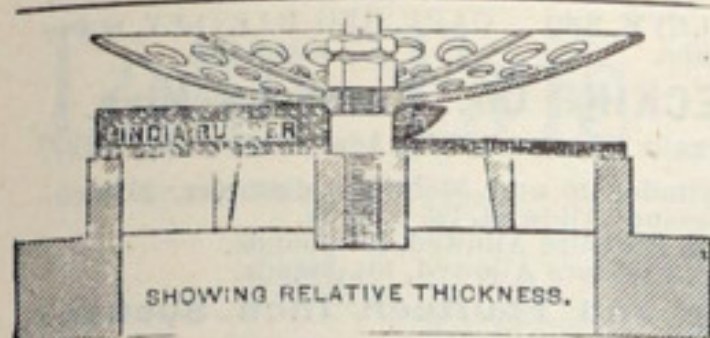
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GREAT NORTHERN RAILWAY LINE.

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30-Foot SLOOP YACHT,

Built this year and in first-class condition.

For particulars address, **DETROIT BOAT WORKS, Detroit, Mich.**

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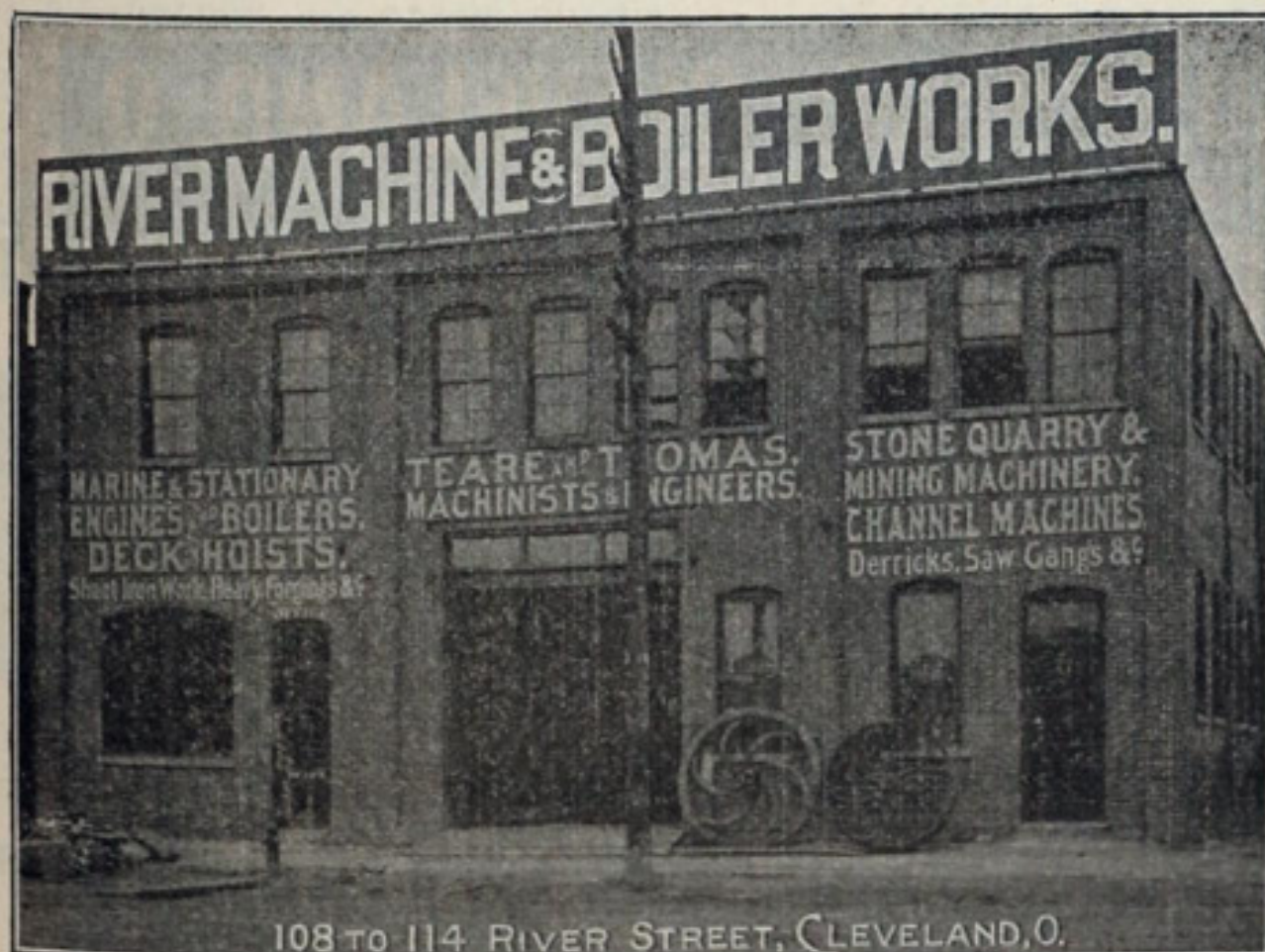
SECOND-HAND TUG ENGINE,

Must be about 24 x 24; Compound preferred.

Address—**MARINE REVIEW,**

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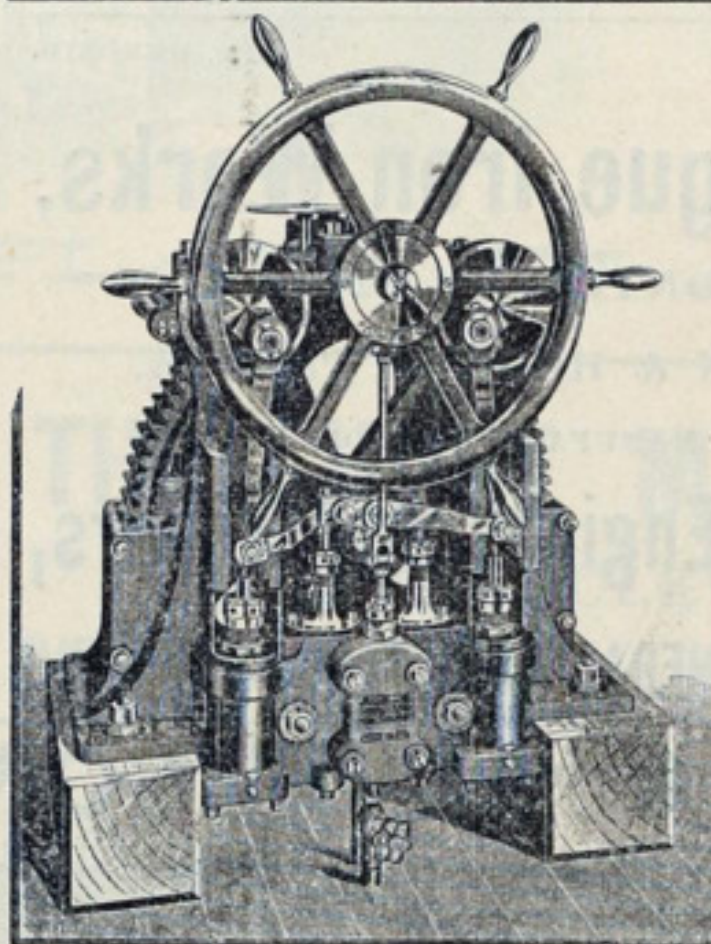


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Steam Steering Gear.

TUG PATTERN—Floor Space 18x36 In.

Changed from steam to hand gear instantly. Rudder moved hard-over, through one or more turns of wheel as desired. Is self-locking. Will cushion any blow on rudder and return to position automatically. All gears are machine cut. Position of Rudder shown by Indicator at all times.

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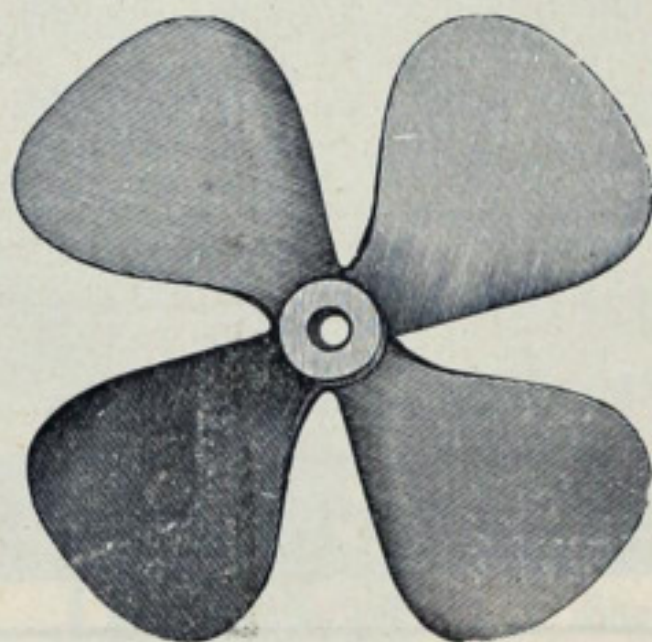
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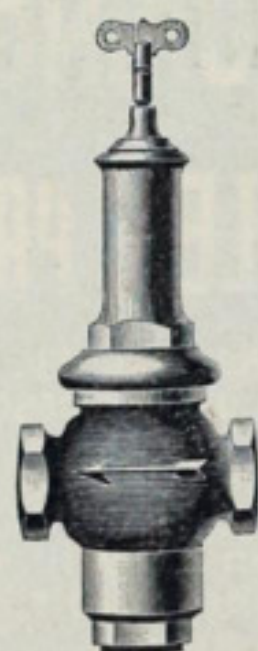
Telephone 163. Correspondence Solicited



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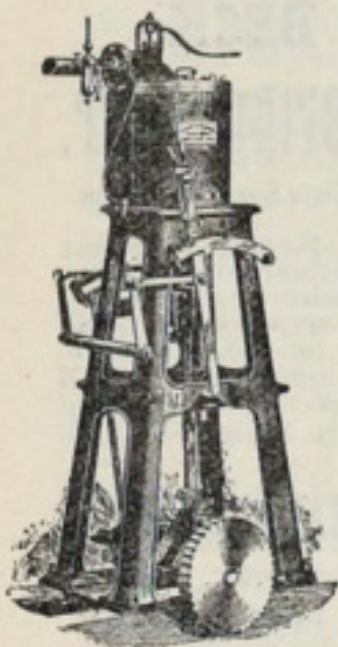
WANTED.**A Good Second-Hand MARINE BOILER,**

Good for at least 100 Pounds Steam, for use in a Steambarge.

State Size, Age, Condition and Price.
Address, **MARINE REVIEW,**
516 Perry-Payne Bldg., Cleveland, O.**P. M. CHURCH & CO.,**
SAVINGS BANK BLOCK, SAULT STE. MARIE, MICH.
LEADING DEALERS IN**Ship Chandlery,**
Marine Hardware, Paints, Oils, Packings, Cordage, Etc.
FIRST-CLASS COPPERSMITH AND TINSHOP IN CONNECTION.**JENKINS BROS.' VALVES**Every valve tested and warranted, all parts interchangeable.
Nothing but best Steam Metal used in the manufacture.
Keyed Stuffing Box and Disc Removing Lock Nut
Is used only in the Jenkins Bros.' Valves.None are genuine unless stamped with "Trade Mark."
Should you order, INSIST on having Jenkins Bros.' Valves.
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J. D. WILSON.

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**Montague Iron Works,**

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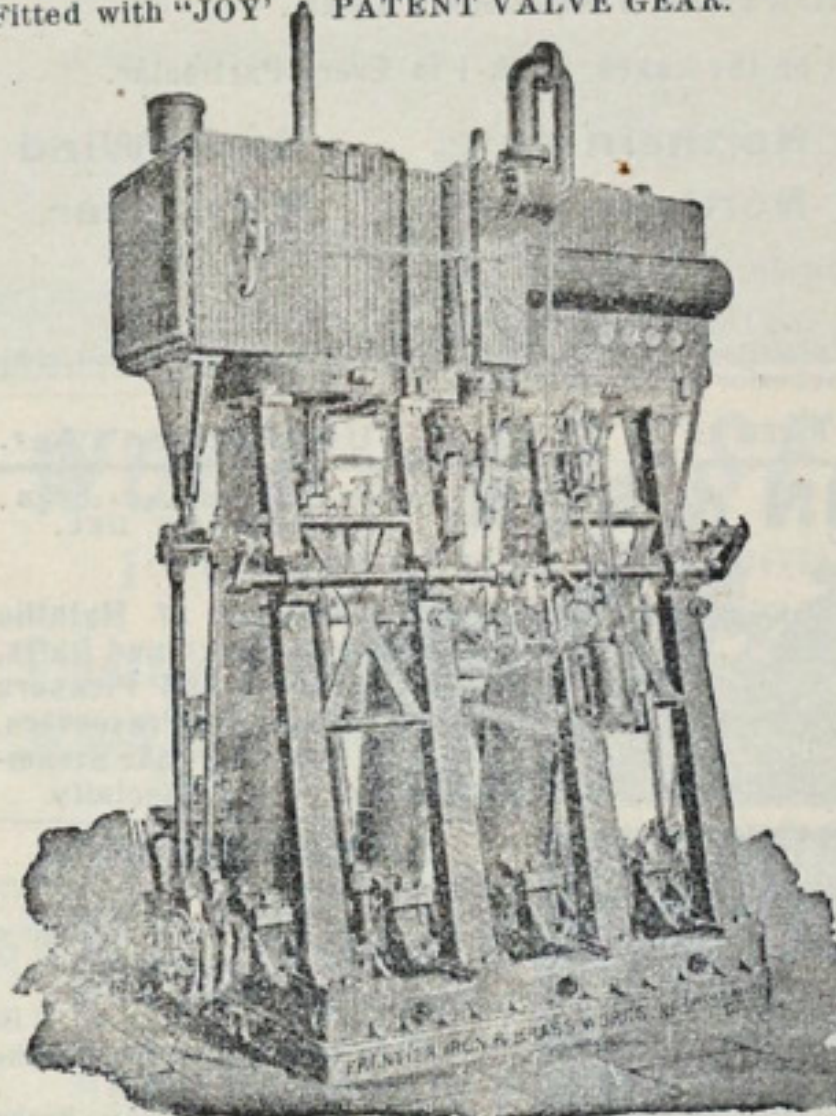
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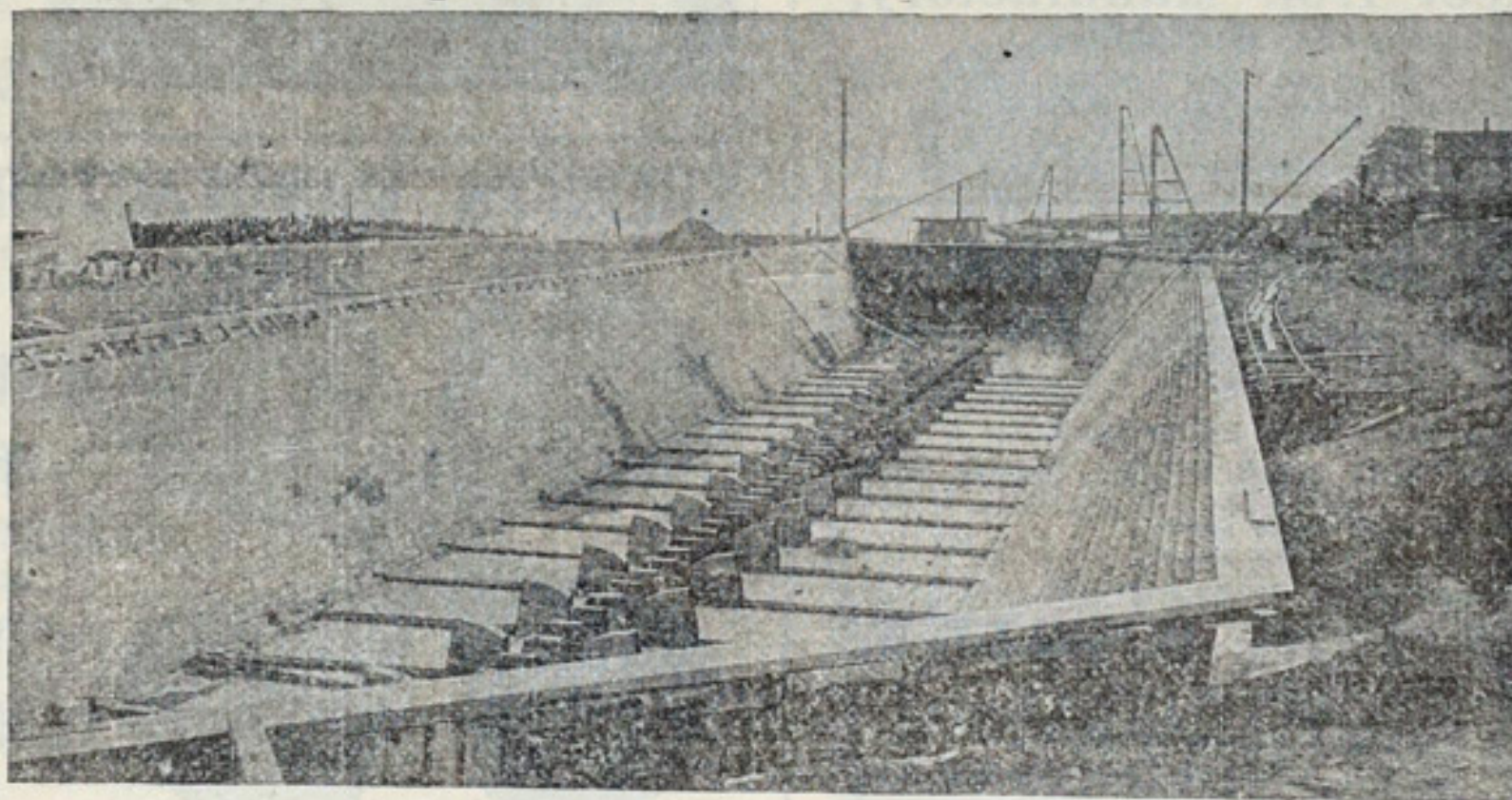
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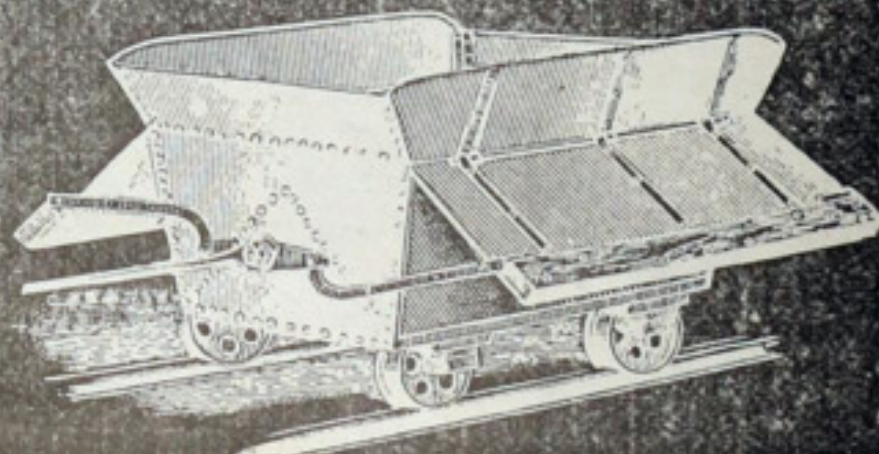
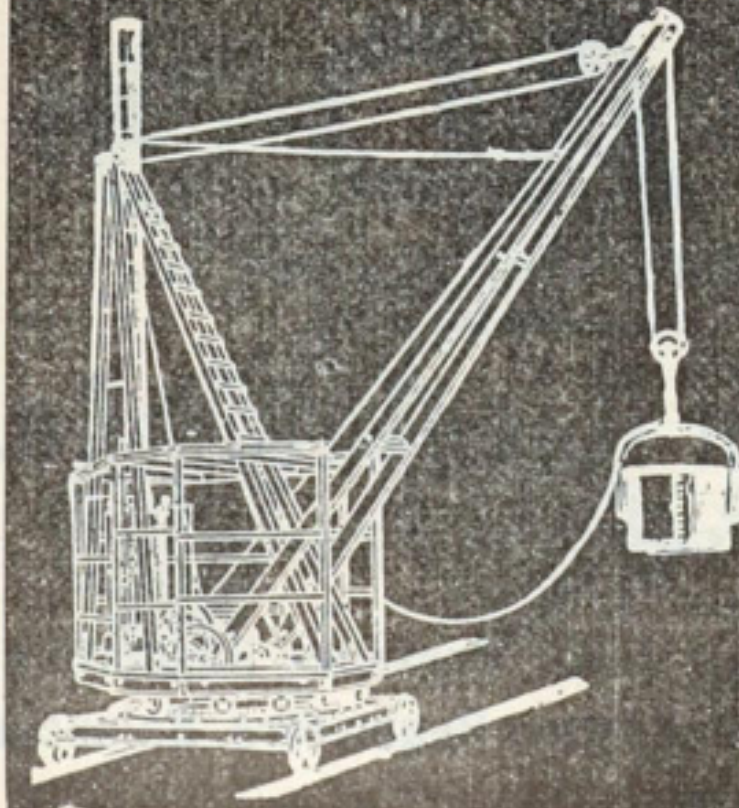
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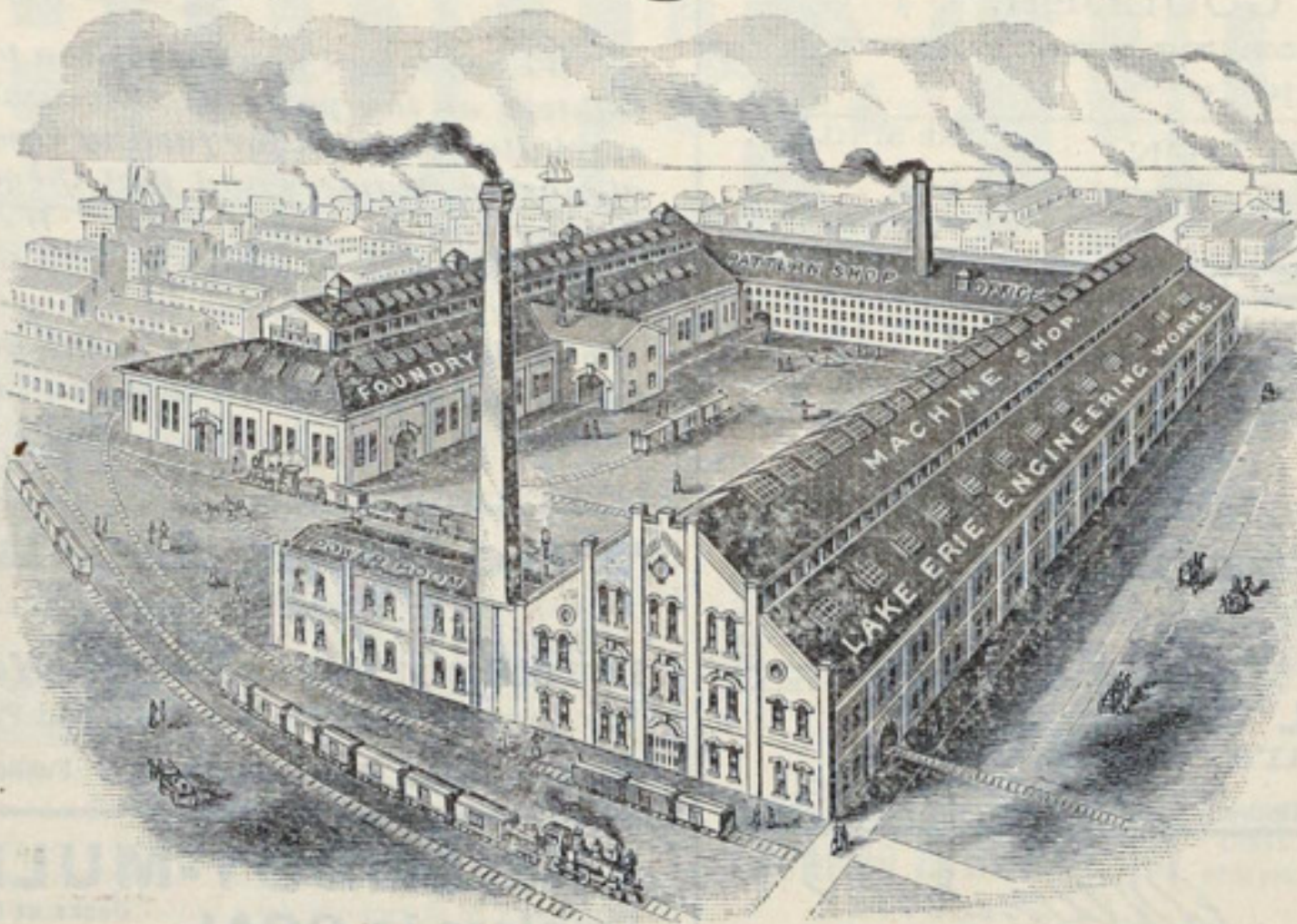
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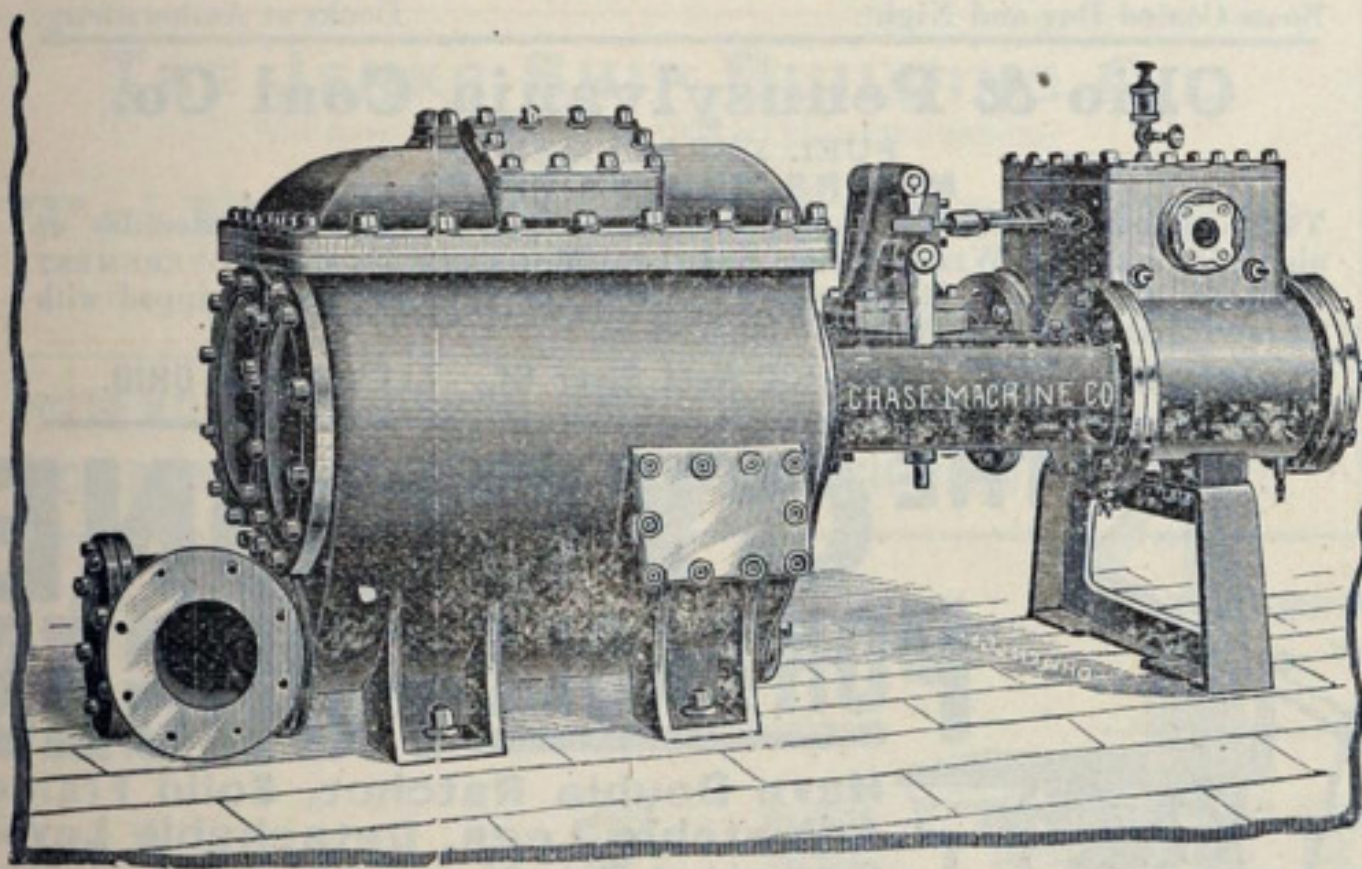
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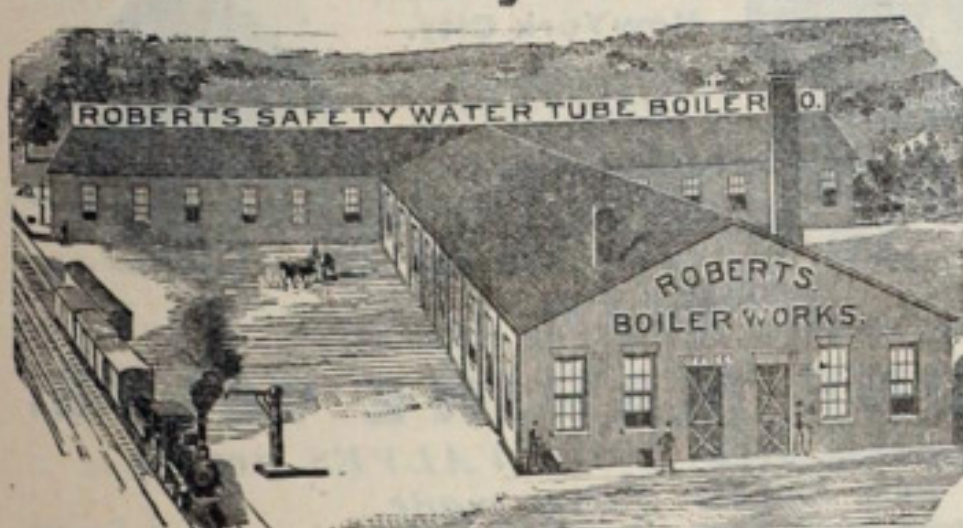
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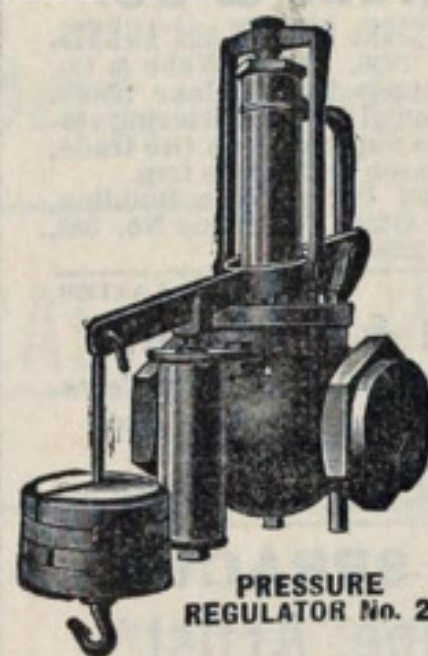
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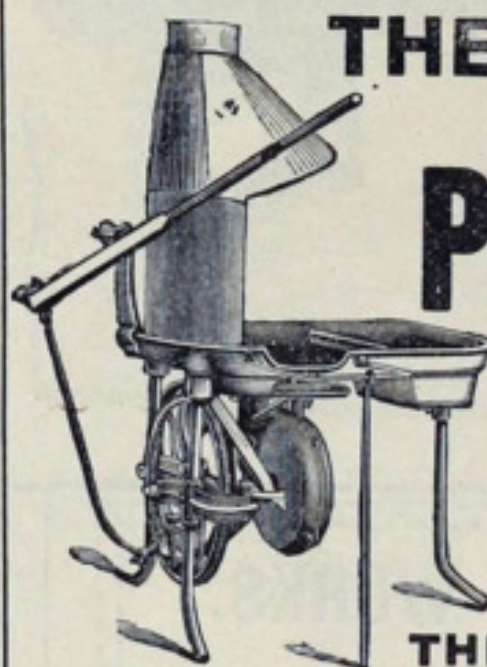
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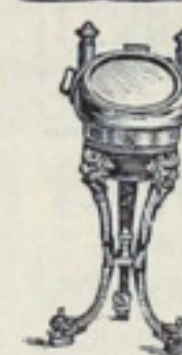


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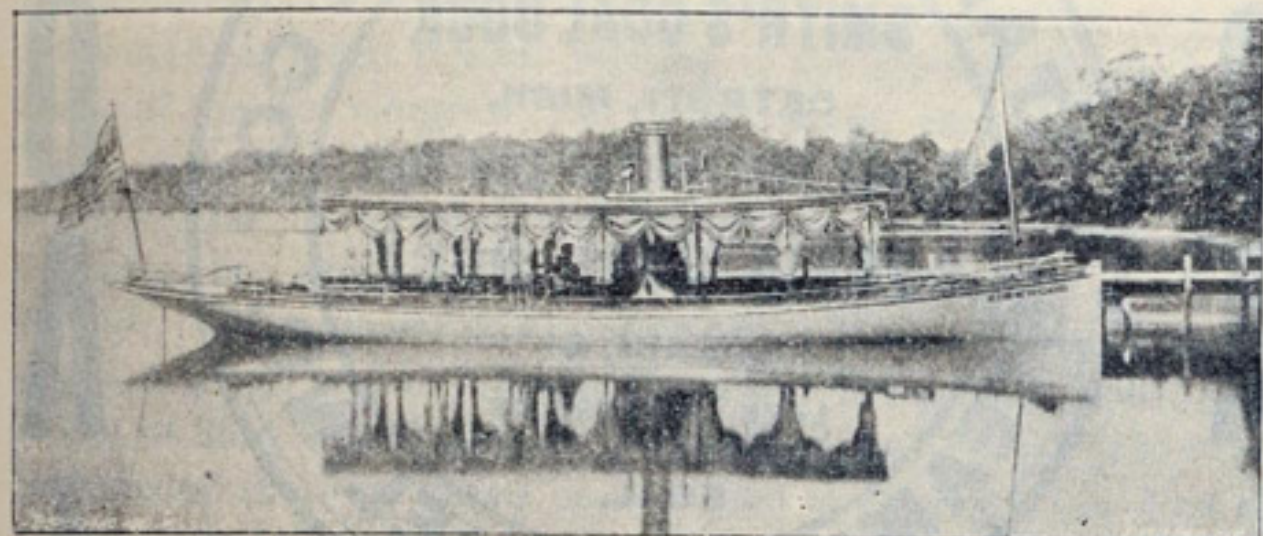
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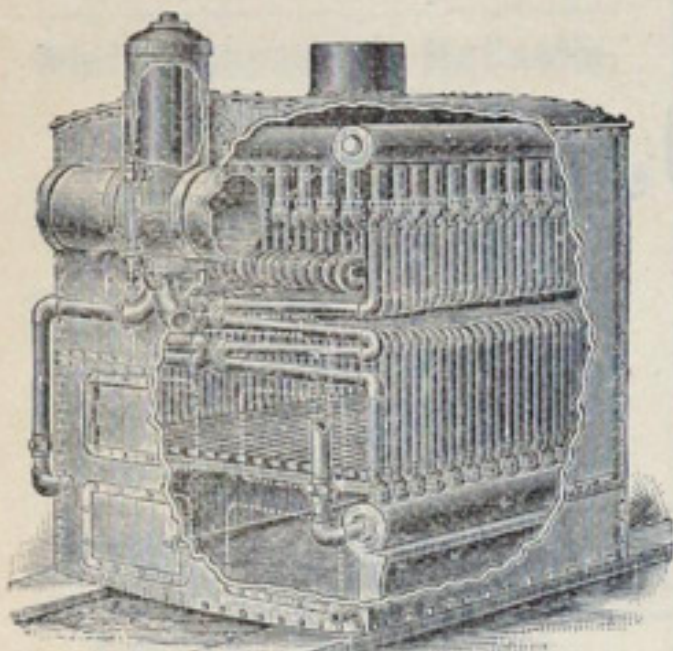
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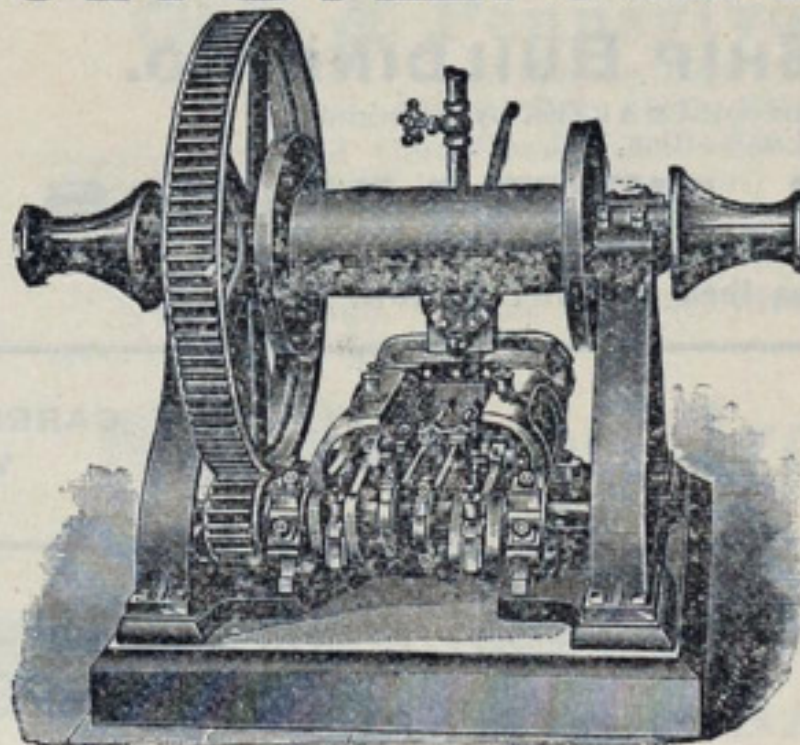
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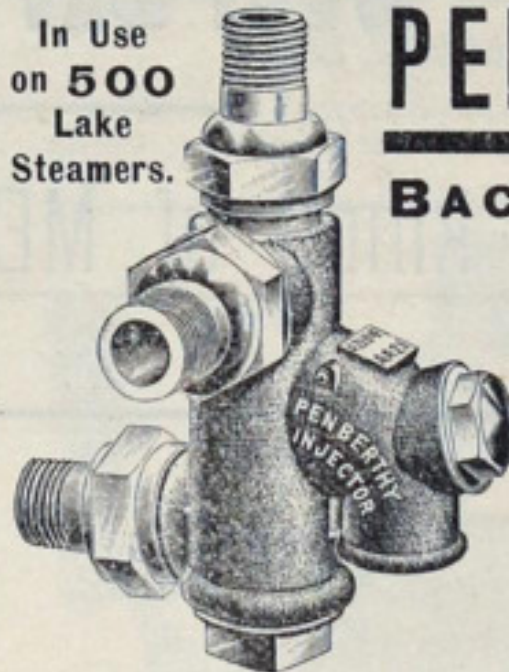
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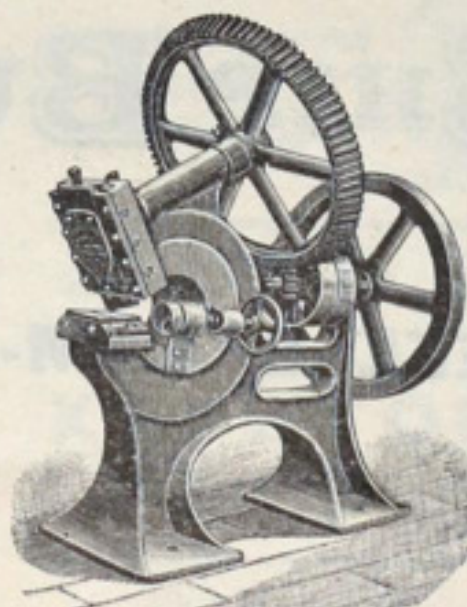
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